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ROYAL AIRCRAFT ESTABLISHMENT
TECHNICAL REPORT No. 65019

# TABLE OF THE ARTIFICIAL EARTH SATELLITES LAUNCHED IN 1957-64

by

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# ROYAL AIRCRAFT ESTABLISHMENT

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Y TABLE OF THE ARTIFICIAL EARTH SATELLITES LAUNCHED IN 1957-64

D. G. King-Hele

## SUMMARY

All known artificial satellites launched before 1 January 1965 are listed chronologically. Lifetimes, weights, dimensions and orbital details are given for instrumented satellites and their final-stage rockets. Other fragments from satellites are listed without these details. The methods used in compiling the Table are described. Many improvements have been made since the previous issue.

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Departmental Reference: Space 89

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### 1 INTRODUCTION

In 1958 the Royal Aircraft Establishment began issuing a Table of artificial satellites, giving lifetimes, weights, dimensions and orbits of all known satellites. Regular issues of this Table have continued, and an extensively revised version, incorporating about a thousand improvements and an index, was distributed in January 1965. This version, slightly amended, forms the basis of the present Report.

Table 1 below gives the number of successful satellite launchings each year and the number of resulting pieces in orbit - instrumented satellites (often with spent rockets attached), separated rockets, and other detectable fragments. Table 1 also gives a similar breakdown of the pieces still in orbit on 1 January 1965.

Table 1
Census of satellites

:	Year	1957	1958	1959	1960	1961	1962	1963	1964	Total
Launchings		2	6	11	18	35	68	55	87	282
	Instrumented satellites	2	6	11	20	40	74	74	102	329
Resulting pieces	Separated rockets	1	2	3	10	13	35	28	46	138
	Other fragments	2	3	1	20	236	81	65	80	488
	Total	5	11	15	50	289	190	167	228	955
Decayed		5	8	10	22	66	141	87	117	456
	Instrumented satellites	-	2	3	10	11	21	32	53	132
Still in orbit	Separated rockets	-	1	2	6	3	14	12	23	61
	Other fragments	-	-	-	12	209	14	36	35	306
	Total	0	3	5	28	223	49	80	111	499

Until 1962 the number of successful launchings in each year was approximately equal to the total number in all preceding years. The number N of launchings in year n of the Space Age, with 1957 as year 1, was given by

$$N \simeq 1.1 \times 2^n \quad (1 \leq n \leq 6)$$

with a maximum error in N of 2. Since 1962 this agreeably simple law has failed, and for the past three years the number of launchings has varied between 55 and 87.

### 2 GUIDE TO TABLE 2

The detailed information about the individual satellites is collected in Table 2, which follows page 10 of this Report. The data given, if available, for all satellites other than fragments, are as follows.

Column 1 gives the name of the satellite and its astronomical designation.

If the name of the satellite is unknown, its launching vehicle is indicated in square brackets. Doubtful entries are indicated by question marks, here and throughout the Table.

Letters to the left of the column have the following meanings:

- D denotes satellites no longer in orbit on 1 January 1965.
- M denotes manned satellites.
- R denotes satellites which returned to earth and were successfully recovered.
- r denotes satellites carrying capsules which returned to earth and were successfully recovered.
- T denotes satellites still transmitting radio signals on 31 December 1964.

For the fragments, D indicates that all the fragments have decayed; 1d indicates that one has decayed; 2d indicates that two have decayed etc.

Column 2 gives the launch date, the lifetime (actual or estimated), and the descent date (if the satellite has decayed). Descent dates after the end of 1964 are in brackets. The dates are given in days and decimals of a day U.T. Thus "1958 Apr. 14.08" means "01 hr 55 min U.T. (or G.M.T.) on 14th of April 1958".

- gives the shape of the satellite and its mass in kilograms.

  Sometimes the shape defies description in a few words and the description given is only approximate (1 kg = 2.205 lb).
- column 4 gives the length and diameter of the satellite in metres (or just the diameter, for a spherical satellite). Since most satellites so far launched have been axially symmetric (or almost so), the length and diameter usually suffice to specify the size. Aerials, paddles carrying solar cells, and other components projecting from the main body are not taken into account when giving the size.

  (1 metre = 3.281 feet.)
- Column 5 gives the date to which the orbital information in columns 6-12 applies.
- Column 6 gives the inclination i of the orbit to the equator (see Fig. 1).
- <u>Column 7</u> gives the nodal period of revolution, the time interval between successive northward crossings of the equator by the satellite.
- specify the size and shape of the orbit. The quantities tabulated are the semi major axis a and eccentricity e; and the perigee and apogee heights, {a(1-e) R} and {a(1+e) R} respectively, where R is the earth's equatorial radius, 6378.2 km.

  (1 km = 0.6214 statute miles = 3281 ft = 0.5396 nautical miles.)
- Column 12 gives the argument of perigee,  $\omega$ , defined as the angle, measured round the orbit, from the northward equatorial crossing N to the perigee P, i.e. the angle NCP in Fig.1.

The names of space vehicles which have escaped from the earth's influence and do not appear in the Table are given at the ends of the appropriate pages of the Table. Fuller details of the space vehicles can be found in Ref.1.

It should be noted that the pages of the Table are numbered independently of this introductory text. The index at the end of the Table will be found useful for locating satellites known by name but not by their international designation.

### 3 METHODS USED

### 3.1 Difficulties

The chief difficulty in compiling Table 2 is the lack of information about the size, shape and weight of the majority of the satellites launched in the years 1962-4. Out of the 87 launchings in 1964, for example, 30 were of Cosmos,

Elektron or Polyot satellites, and (apart from the shape of the Cosmos and Elektron satellites<sup>2</sup>) no information about these satellites or their rockets seems to have been published. United States military satellites accounted for at least another 27 launchings during 1964, and no details of these satellites have been given, apart from the diameter of the Agena rockets. In contrast, full details are available of satellites launched by NASA. Our methods of combating these difficulties are outlined in section 3.4. Numerous uncertainties remain, however, and we regret the many blank entries in the Table.

# 3.2 Names and designations of satellites

The names given by the launching authorities are indicated whenever they are known. For unnamed United States Air Force satellites, the launching vehicle is given in square brackets. The name 'Midas' has been retained for all Agena-type satellites in near-polar, near-circular orbits at heights close to 3700 km, since observers find it useful to have a distinctive label for these satellites. The name 'Transit' has been given to those satellites in near-circular polar orbits at heights close to 1000 km which are believed to form a continuation of the navigation-satellite project formerly known as the Transit system.

Some of the names are given as initials only, and the meanings of these (for satellites launched in 1964) are as follows: GGSE = gravity gradient stabilization experiment; IMP = interplanetary monitoring platform; OGO = orbiting geophysical observatory; SECOR = sequential collation of range; SR = solar radiation; TRS = tetrahedron research satellite.

The international designation of each satellite launching is now satisfactorily allocated by the World Warning Agency on behalf of COSPAR. But the identification of particular pieces in a multiple launch has often depended on visual observations, since an experienced visual observer can often recognize the species of rocket or satellite he is looking at, and can usually distinguish easily between a satellite and its rocket. Small pieces which are, as far as is known, not instrumented satellites, are called fragments. The lists issued by the United Nations are helpful in identifying fragments.

### 3.3 Lifetimes

The orbits of most satellites contract slowly under the action of air drag, and the severity of the drag determines their lifetimes, which can be estimated from the rate of change of orbital period, using the theoretical formulae 3-5. It is thus tacitly assumed that their orbits will suffer no major disturbances in the future - from the burning of residual propellants or impacts by meteors, etc. -

and that the satellites will not be swept up as space-rubbish. For most short-lived satellites (< 3 years life) the lifetime estimates are usually accurate to within 10%. For long-lived satellites (> 5 years life), the lifetimes are less certain, since they depend critically on solar activity, which controls the air density: it has been assumed that the average solar activity in future sunspot cycles will be the same as the average between 1959 and 1964, and that the dates of the next few sunspot maxima and minima are as predicted in Ref.6.

For some of the satellites in high-eccentricity orbits, such as Explorers 12, 14, 18, 21 and 26, 0GO 1, and Elektrons 2 and 4, the lifetime depends primarily on luni-solar perturbations rather than air drag, and lifetime estimates are often rather uncertain for these satellites.

# 3.4 Weights and dimensions

The weights and dimensions of the satellites come from various sources 'Spacewarn' telegrams, NASA Press Releases, <u>Pravda</u>, the satellite observing notes
issued by the Radio Research Station, Slough, the International Geophysics
Bulletins of the U.S. National Academy of Sciences, and other sources, including
Press reports. Some indication of the accuracy of the individual weights and
dimensions is given by the number of significant figures. Often it is difficult
to define the 'length' of a satellite which bristles with aerials, etc, and
lengths are therefore sometimes approximate.

For satellites whose weights and sizes have not been published, the following procedure can be adopted. First, the average cross-sectional area S can be approximately determined from the average brightness when observed visually; then, if the satellite is non-spherical, its length/diameter ratio can be estimated approximately from the variations in brightness. Finally the mass/area ratio m/s can be obtained from the rate of change of orbital period and the air density at perigee height. To apply this procedure to all relevant satellites would be a lengthy task, and we have used it only on small samples, assuming that all satellites of a particular type are similar.

The dimensions given in Table 2 were derived as follows. The sizes of the Cosmos and Elektron satellites and rockets have been based on the values given by Pilkington. For the Vostok satellites the masses are known and mass/area ratios have been calculated from the rates of change of orbital period: this gives the effective cross-sectional area and hence the diameter if, as is probable, the Vostoks are stabilized with axis tangential to the orbit. For Agena rockets launched by the United States Air Force, the published diameter of 1.5 m has

been given; the length of the Agena rocket alone averages about 6m, but the satellites also carry payloads, which may presumably increase the length by up to about 4m. So the lengths are given as 8m?, implying  $8 \pm 2m$ .

Once the cross-sectional area is approximately known, mass/area ratio is determined from the rate of change of orbital period, and hence values are found for the masses of the satellites. The most careful estimates of m/S which we have made are for various Cosmos satellites (and two others) and are obtained from Ref.8.

They are as follows:

Satelli	te	$m/S (kg/m^2)$	Satellite	$m/S (kg/m^2)$
Cosmos	2	190	Cosmos 38	100
***	5	150	" 39	100
28	8	220	Star-rad (Agena)	140
**	11	170	1962 η1	290
**	25	170		
11	26	220		
**	31	170		

All the Cosmos satellites in the first column above were in orbits of  $49^{\circ}$  inclination, and since the values of m/S do not depart from 200 kg/m<sup>2</sup> by more than 25%, this value has been adopted for all  $49^{\circ}$  Cosmos satellites in Table 2. Several other values of m/S for Agena rockets have been calculated and generally lie fairly close to  $140 \text{ kg/m}^2$ . Similarly a number of values calculated for Cosmos rockets were close to  $70 \text{ kg/m}^2$ . The weights assigned to the various Agena and Cosmos rockets are derived from these values of m/S.

We hope that most of the weights and dimensions given with question marks are accurate to within a factor of 1.5. It seemed better to give some indication of the weights and sizes, even if approximate, than to leave blanks.

### 3.5 Orbital accuracy

Orbital information has come from many different sources. More than half of the orbits have been based on information issued in the United States Spadats/Spacetrack Bulletins, while the remainder come mainly from three sources, the Smithsonian Astrophysical Observatory, NASA and R.A.E. It is impracticable to give full references, and indeed inappropriate, since many of the orbits have been smoothed and altered whenever they appeared inconsistent, following methods described previously.

The accuracy of the orbits varies greatly between one satellite and another, and no detailed guide can be given. Most orbits which are free of question marks, however, are believed to have an error (s.d.) of about 0.03° in orbital inclination, 0.02 min in period, 2 km in semi major axis, 4 km in perigee and apogee heights (for apogee heights less than 2000 km), 0.001 in eccentricity e, and perhaps 3° in argument of perigee (if e > 0.02). Some orbits are much more accurate than this, and some, particularly those with eccentricity exceeding 0.2 or with very short lifetimes, may be much less accurate.

# 4 RADIO TRANSMISSIONS

It is difficult to give precise information about radio transmissions from satellites for various reasons. Many satellites operate on command only, and the state of health of their transmitters is known only to those concerned with giving the commands. Other satellites transmit either sporadically or only when they have been in full sunlight for longer than a (variable) minimum time. Since there are so many uncertainties we have decided not to give a table of frequencies, but merely to indicate the frequencies used by various types of satellites.

Details of the operating frequencies of United States non-military satellites can be found in the fortnightly NASA Satellite Situation Report.

Most scientific satellites launched by NASA operate on frequencies between 136 and 137 Mc/s: the outstanding exception is the veteran Vanguard 1, which is still transmitting while in sunlight, on 108.0 Mc/s. 0GO 1 has additional frequencies near 400 Mc/s, and the Syncom communication satellites use further frequencies between 1814 and 1821 Mc/s. Satellites of the Transit and associated systems, operate either on 150 and 400 Mc/s or on the four linked frequencies 54, 162, 324 and 648 Mc/s. The Russian Cosmos satellites normally operate at frequencies near 20 Mc/s and sometimes also near 90 Mc/s.

### ACKNOWLEDGMENTS

We are greatly indebted to the various sources mentioned in the text for making available information about the satellites. We also thank Mr. J.A. Pilkington of the London Planetarium for many helpful criticisms and suggestions on points of detail, and Mr. D. Gray of the Radio Research Station, Slough, for giving us much useful information. We have also benefited from the work of Mrs. Doreen Walker and Mrs. Janice Rees on earlier versions of the Table.

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# TABLE OF ARTIFICIAL EARTH SATELLITES

(Year of launch 1957)

Page 1

Name	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Sputnik 1 1957 a 2	1957α2 1957 Oct. 4.8 92 days? 1958 Jan. 4?	Sphere 83.6	0.58 dia.	1957 Oct. 4.8 1957 Oct. 25.8 1957 Dec. 25.1	65.1 65.1 65.0	96.2 95.4 91.0	6955 6916 6702	215 213 190	939 863 458	0.052	58 49 23
Sputnik 1 1957 a 1 rocket	1957a1 1957 Oct. 4.8 57.6 days 1957 Dec. 1.4	Cylinder? 5000?	20 long?	1957 Oct. 4.8 1957 Nov. 4.0 1957 Nov. 24.3	65.1 65.1 65.0	96.2 94.0	6955 6849 6702	203	939 738 458	0.052	58 36 36
Fragment 1957@3											
Sputnik 2 1957β1	1957 β 1 1957 Nov. 3.1 162.0 days 1958 Apr. 14.08	Cone-cylinder 5000? Payload 508,3	25 long?	1957 Nov. 3.1 1958 Jan. 4.0 1958 Feb. 21.0 1958 Mar. 25.0 1958 Apr. 9.0	65.33 65.29 65.29 65.29	103.750 7314 100.505 7161 97.105 6999 93.785 6838 90.780 6691	7314 7161 6999 6838 6691	212 210 200 187 166	1660 1356 1040 733 460	0.099 0.080 0.060 0.040	59 35 14 359
Fragment 1957β 2											

Q

Page 2

	Name		Launch date, lifetime and descent date	Shape aweight	and (kg)	Size (E)	Date of orbital determination	ion	Orbital inclina- tion (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
	Explorer 1	1958	1958 Feb. 1.16	Cylinder 13.97 Payload 4.8		2.03 long	1958 Feb. 1960 Dec. 1963 Nov.	1.2 5.3 9.3	33.24 33.21 33.19	114.8 107.2 104.89	7830 7481 7570	356	2548 1859 1641	0.140 0.101 0.088	121 10 102
H	Vanguard 1	1958 <b>B</b> 2	1958 Mar. 17.51 300 years	Sphere 1.47		0.16 dia.	1958 Mar. 1962 Nov.	17.5	34.25	134.18	7898 1298	650	3968	0.191	<u>8</u> 2. 89
	Vanguard 1 rocket	1958 <b>β</b> 1	1958 Mar. 17.51 300 years	Cylinder 23		1.2 long 0.51 dia.	1958 Mar. 1962 Dec.	17.5	34.25	138.50	8872 8864	61/9	1,340	0.208	138
Q	Explorer 3	1958 ₹	1958 Mar. 26.75 93 days 1958 June 28	Cylinder 14 Payload 5	ler 5	2.03 long 0.15 dia.	1958 Mar- 1958 May 1958 June	26.8 15.0 14.1	33.38 33.35 33.35	115.7 104.8 96.8	787 7869 6980	186 180 171	2799 1802 1052	0.166 0.110 0.063	326 73 99
Д	Sputnik 3	1958 &2	1958 May 15.3 692.0 days 1960 Apr. 6.3	5 Cone 1327		3.76 long	1958 May 1959 Jan. 1960 Jan. 1960 Mar.	15.3 1.3 3.8 24.5	65.18 65.15 65.11 65.06	105.97 102.000 94.000 90.000	7418 7232 6849 6653	217 210 190 162	1864 1497 751 388	0.111 0.089 0.041 0.017	58 331 146
Ω	Sputnik 3 rocket	1958 <b>6</b> 1	1958 May 15.3 202.4 days 1958 Dec. 3.7	Cylinder? 50007		20 long?	1958 May 1958 Aug. 1958 Oct. 1958 Nov.	15.3 15.1 11.2 30.6	65.18 65.14 65.00	102.000 98.000 90.000	7415 7232 7042 6653	214 210 199 162	18 <b>6</b> 0 1497 1128 388	0.111 0.089 0.066 0.017	28 26 339
Q	Fragments 19	1958 & 3-5													
Q	Explorer 4	1958 &	1958 July 26.63 454 days 1959 Oct. 23	Cylinder 17.5 Payload 8	8 8	2.03 long	1958 July 1959 Mar. 1959 Aug. 1959 Oct.	26.7 21.0 22.0 19.5	50.25 50.25 50.25 50.25	110.18 102.37 96.05 90.0	7616 7252 6950 6656	263 257 239 204	2213 1490 906 351	0.128 0.085 0.048 0.011	50 60 120 120
Ω	Atlas	1958 &	1958 Dec. 18.96 33.6 days 1959 Jan. 21.6	Cylind 3900 Payload	Jo N	25 long 3.0 dia	1958 Dec. 1959 Jan. 1959 Jan.	19.0	32.3 32.3 32.3	101.47 98.12 92.7	7213 7053 6792	185 181 169	1484 1169 658	0°0°0 0°0°0 0°0°0	130 249 37

Spece vehicles: Pioneer 1, 1958 m; Pioneer 3, 1958  $\theta$ 

Name 11fetime and	-		Shape	and	Size	Date of	Orbital inclina-	Nodal nerio	Semi	Perigee	Apogee	Apogee Orbital	Argument
	weight	weight	weight (kg)		(E)	determination	tion (deg)	(min)	(km)	(Icm)	Î.	tricity	rerigee (deg)
Vanguard 2 1959 at 1959 Feb. 17.67 Sphere 150 years 9.8	1959 Feb. 17.67 150 years		Sphere 9.8		0.51 dia.	1959 Feb. 17.7 1962 Nov. 13.0	32.88 32.87	125.7 125.25	8318 8298	559 559	3320	0.166	135
Vanguard 2 1959 a.2 1959 Feb. 17.67 Cylinder 25	1959 Feb. 17.67 150 years		Cylinder 23		1.2 long 0.51 dia.	1959 Feb. 17.7 1962 Dec. 5.6	32.92	130.0	8506	563	3693	0.184	135
Discoverer 1 1959 β 1959 Feb. 28.91 Cone-cylinder 6 long 5 days? 618 1.5 dis	1959 Feb. 28.91 5 days? 1959 Mar. 5?	b. 28.91 r. 57	Cone-cylind 618	er	6 long 1.5 dia.	1959 Feb. 28	89.77	967	694,37	1637	9687	0.0587	ī
Discoverer 2 1959 x pr. 13.89   Cone-cylinder 6 long 13 days	1959 Apr. 13.89 13 days 1959 Apr. 26.67		Cone-cylind 1st day 743 then 650	er	6 long 1.5 dia.	1959 Apr. 13.9 1959 Apr. 24.6	89.9	90°7 88°9	1 <b>6</b> 997	239	346	0,008	96
Explorer 6 1959 & 1959 Aug. 7.60 Spheroid + 23 months? 4 vanes 1961 July? 64	1959 Aug. 7.60 23 months? 1961 July?	7.60	Spheroid + 4 vanes 64		Spheroid 0.66 dia. 0.74 long	1959 Aug. 7.6 1959 Oct. 26.0 1959 Dec. 19.2	0°27	有多效	2770 27590 27450	245 449 753	42400 42200 41900	15.00 16.00 16.00 16.00	35 53 <b>65</b>
Explorer 6 1959 & 2 anonths? 24 24 24 24 24 24 24 24 24 24 24 24 24	1959 Aug. 7.60 23 months? 1961 July?	7.60	Cylinder 24		1.47 long 0.46 dis.	Orbit: similar to 1959 &1	1959 &1						
Discoverer 5 1959£1 1959 Aug. 13.79 Cone-cylinder 6 long 46 days 1st day 781, 1.5 dis 1959 Sep. 28 then 640	1959 Aug. 13.79 46 days 1959 Sep. 28		Cone-cylind 1st day 781 then 640	,	6 long 1.5 dis.	1959 Aug. 13.8 1959 Sep. 9.1 1959 Sep. 23.4	0.00	94.19 92.00 90.00	6856 6749 6651	217 209 193	739 533 353	0.038 0.024 0.012	55 S
Discoverer 5 1959g 2 1959 Aug. 13.79 Paraboloid 547 days 140	1959 Aug. 13.79 547 days 1961 Feb. 11	13.79	Paraboloid 140	T	0.6 long 0.9 dis.	1960 Feb. 15.1 1960 Dec. 2.3 1961 Jan. 31.3	76°82	104.27 94.45 90.68	7537 6869 6685	218 202 180	1700 173 1,34	0.101	47 320 124

Argument of perigee (deg)	143 360 297	133 112 119	182 186	55 337 10	78 85°	165 138 120	156 356 206
Orbital eccen- tricity	0.046 0.026 0.013	0.190 0.189 0.189	0.824	0.037 0.036 0.036	0.037	0.050 0.038 0.029	0.102
Apogee height ;km)	848 547 359	374 3723 3720	476500 507400	1088 1074 1075	1087 1057 1054	847 673 542	1679 11147 580
Perigee height (km)	212 196 186	512 511 510	15700	556 556 555	554 553 551	159 157 152	187 176 162
Semi major axis (km)	6908 6749 6651	850 <b>6</b> 8495 8495	264800	<b>720</b> 0 7193 7192	7199 7183 83	6881 6793 6725	7311 7040 6749
Nodel period (min)	95.27 92.00 90.00	130.0 129.75 129.44	22700	101.28 101.12 101.12	101.25	94.70 92.9 91.5	103.72 98.00 92.00
Orbital inclina- tion (deg)	0°178 . 0°178	33.35 33.34 33.34	75.8	50.31 50.31 50.30	50.30 50.30 50.30	81.64 81.6 81.6	80.65 80.6 80.6
Date of orbital determination	1959 Aug. 19.9 1959 Bep. 28.2 1959 Oct. 12.7	1959 Sep. 18.3 1961 Apr. 26.0 1963 Dec. 10.0	1959 Oct. 18.7 1959 Dec. 22.5	1959 Oct. 13.7 1962 Jan. 14.0 1963 Oct. 20.3	1959 Oct. 13.7 1962 Jan. 27.0 1964 Aug. 26.8	1959 Nov. 7.9 1959 Nov. 15.6 1959 Nov. 20.8	1959 Nov. 20.9 1960 Jan. 15.5 1960 Feb. 29.5
Size (m)	6 long 1.5 dia.	2.5 long 0.51 dia.	1.32 long	0.76 long 0.76 dia.	1.75 long 0.15 dia.	6 long 1.5 dia.	6 long 1.5 dia.
Shape and weight (kg)	Cone-cylinder 1st day 783, then 640	Rocket-sphererod 45	Ellipsoid 278.5	Double cone 41.5	Cylinder 6	Cone-cylinder 1st day 794, then 660	Cone cylinder 1st day 795, then 660
Launch date, lifetime and descent date	1959 Aug. 19.81 62.0 days 1959 Oct. 20.8	1959 Sep. 18.22 Rocket-sphere- 300 years rod 45 Payload 23	1959 Oct. 4.1 177 days? 1960 Mar 29?.	1959 Oct. 13.65 70 years	1959 <b>t</b> 2 1959 Oct. 13.65	1959 Nov. 7.85 19.0 days 1959 Nov. 26.8	1959 Nov. 20.81 108.2 days 1960 Mar. 8.05
	1959 Z	1959 ח	1959 01	1959 6.1	1959 62	1959 К	1959 λ
Name	D Discoverer 6 1959 Z	Vanguard 3	D Lunik 3	Explorer 7	Explorer 7 rocket	Discoverer 7 1959 K	Discoverer 8

Space vehicles: Lunik 1, 1959 µ; Pioneer 4, 1959 ν; Lunik 2, 1959 ξ

A rocket separated from Lunik 3, but its orbit is not known

Year of launch 1960

	Name	98	Launch date, lifetime and descent date	and late	Shape and weight (kg.)	Size (m.)	Date of or orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Orbital eccen- tricity	Argument of perigee (deg.)
	Tiros 1	1960 B 2	1960 Apr. 60 years	1.49	Cylinder 120	0.48 long 1.07 dia.	1960 Apr. 1.5	48.4	99,16	7100	693	750	†00°0	115
	Tiros 1 rocket	1960 <b>β</b> 1	1960 Apr. 25 years	1.49	Cylinder 23	1.50 long 0.46 dia.	1960 Apr. 1.5 1962 Feb. 26.2	48 <b>.</b> 41	99,15	7099	693	750	†700°0	115
	Fragments	1960 <b>β</b> 3-4												
	Transit 1B	1960 Y 2	1960 <b>y</b> 2 1960 Apr. 7 years	13.50	Sphere 121	0,91 dia.	1960 Apr. 13.5 1961 June 23.7 1963 Nov. 20.6 1964 Aug. 17.8	7 28 28 28 28 28 29 29 29 29 29 29 29 29 29 29 29 29 29	95.89 94.94 93.85	6939 6897 6884 6844	373 367 356 349	748 670 596 582	0.027 0.022 0.017 0.017	261 288 306
Q	Transit 1B rocket	1960 Y1	1960 Apr. 13.50 491.7 days 1961 Aug. 18.19	13.50	Cylinder 600	5.3 long 1.40 dia.	1960 Apr. 13.5 1960 Dec. 8.6 1961 June 16.8	7 7 7 7 2 2 7 2 2	95.25 93.21 91.05	6912 6813 6707	319 285 255	74.8 584 1403	0,031 0,022 0,011	26 <b>5</b>
19	Fragments	1960×3-4												
Q	Discoverer 11 1960 <b>δ</b>	11 1960 <b>δ</b>	1960 Apr. 15.85 10.88 days 1960 Apr. 26.73	15.85	Cone-cylinder 1st day 790, then 660	6 long 1.5 dia.	1960 Apr. 16.9 1960 Apr. 24.7	80.1	92.16 89.75	6757 6639	170	589	0,031	150

Space vehicle: Pioneer 5, 1960 a

Continued on page 6

	Лате	Launch date, lifetime and descent date	Shape and weight (kg)	Size	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min)	Semi major axis (km)	Perigee Apogee height height (km) (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Ω	Sputnik 4 1960 E 1	1960 May 15.00 844,41 days 1962 Sep. 5.41	Cylinder? 20407 Payloed 1477	6 long? 1960 1.6 dia? 1961 1962	1960 May 19.0 1961 June 29.4 1962 Jan. 27.5 1962 Aug. 5.8	65.02 65.02 65.02 64.95	94.25 92.53 91.44 89.50	6861 6777 6724 6628	28 C 73 C 7	675 514 120 27	0.028 0.017 0.011 0.004	87 273 183 94
Q	Sputnik 4 1960 & 2 rocket	1960 May 15.00 63.82 days 1960 July 17.82	<b>Cylinder?</b> 2000?	10 long? 2 dla?	1960 May 15.0 1960 June 6.8 1960 July 15.5	66.43 98.43 98.43	91.25 90.73 88.69	6714 6692 6588	318 239 206	355 329 215	0.002	53
	Sputnik 4 1960 g 3 cabin	1960 May 15.00 5 years	Cylinder? 2500	5 lang? 2 dia?	5 tang7 1960 May 19.0 2 dta? 1961 June 25.3 1962 Nov. 25.8 1964 Aug. 20.9	65.0 65.0 64.98 64.98	94.27 93.35 92.41 91.07	6862 6817 6771 6706	278 275 271 267	689 602 515 388	0.030 0.024 0.018 0.009	8825
Q	Fragments 1960 g4-9											
	Midas 2 1960 21	19 <b>60 May</b> 24.73 20 years	Cylinder 2300	7 long 1.5 dia.	1960 May 24.8 1963 Dec. 9.0	33.0	94.44	6876 6867	†2† †8†	511 504	0.002	136
	Midas 2 1960 ද 2 nose-cap	1960 May 24.75 194.5 days 1960 Dec. 5.3	ı	ı	1960 May 24.8 1960 Oct. 9.5 1960 Dec. 2.6	33.00 33.00 33.00	94.44 93.02 89.73	6799 2089 9289	184 152 153 153 153	511 436 172	0.002	136 46

The designation of the nine pieces of Sputnik 4 is that adopted in the United States. Russian and British prediction centres referred to Sputnik 4 as £2 and the rocket as £1. Between 1960 May 15.0 and May 19.0 satellites 1960 £1 and 1960 £3 to 9 were one piece, whose orbit was similar to that of 1960 £2.

A

Year of launch 1960, continued

	Launch date, Iffetime and descent date	Shape and weight (kg.)	Size (E)	Date of or orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- najor axis (km.)	Perigee height (km)	Apogee height (km)	Orbital eccen- trioity	Argument of perigee (deg)
Transit 2A 1960m 1	1960 June 22,25	Sphere 101	0,911 dia.	1960 June 22,3	69 <b>°</b> 99	101.66 101.63	7216	628 627	1047 1045	0.029	236
Greb 1 1960 η 2	1960 June 22,25 80 years	Sphere 19	0.51 dfa.	1960 June 22,3	69 <b>°</b> 99	101.66	7216	614	1061	0.031	236
Transit 2A 1960m 3 rocket	1960 June 22,25 80 years	cylinder 450	5.3 long 1.40 dia.	1960 June 22,3 1961 June 27,6 1963 Mar. 25,2	66.7 66.66 66.66	101.37 101.42 101.41	7202 7203 7201	615	1032 1034 1051	0.029	235 333 243
Fragments 1960n4-5											
<b>Discover</b> er 13 1960 θ	1960 Aug. 10.86 95.97 days 1960 Nov. 14.83	Cone-cylinder 1st day 850, then 700	6 long	1960 Aug. 10.9 1960 Oct. 9.9 1960 Nov. 9.4	8.8 8.8 8.8	388	6849 6749 6651	258 250 226	683 493 319	0.031	25.55 17.8 17.8
Echo 1 1960 6 1	1960 Aug. 12.40 7 years?	Inflated sphere 75,9 initally; 62 after Jan,1961	30 dia.	1960 Aug. 12.4 1960 Dec. 16.0 1961 June 20.0 1962 May 8 1962 Nov. 20.0 1963 Bep. 4 1964 Aug. 9.3	47.22 47.27 47.20 47.30 47.30 47.30 47.20 47.20	118,22 117,28 117,03 116,18 116,17 111,82	7982 7989 7889 7887 7887 7887 7887	4821 9881 49821 548 548 758	1684 2157 1550 2120 2120 1524 2010 1926	0.010 0.077 0.002 0.002 0.001	25 8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
Echo 1 1960 L 2 rocket	1960 Aug. 12,40 20,000 years?	cylinder 23	1.5 long 0.46 dia.	1960 Aug. 12.4 1963 Dec. 3.0	47.23	117,98	27.27 17.27	1502	1685 1684	0,011	12 8
Fragments 1960 L 3-5			·								

Year of launch 1960, continued

	Мете		Launch date, lifetime and discent date	Shape and weight (kg.)	Size (m)	Date of orbital determination		Orbital inclina- ition (deg.)	Nodal period min)	Semi major axis (km)	Perigee Appgee height (km) (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
QH	Discoverer 14 1960 K	<b>26</b> 00	1960 Aug. 18.83 28.19 days 1960 Sep. 16.02	Cone-cylinder 1st day 850, then 700	6 long 1.5 dia.	1960 Aug. 18.9 1960 Aug. 30.8 1960 Sep. 10.1		73.65 73.65 73.65	94.55 93.00 91.00	4789 6798 6701	82 12 12 12 12 12 12 12 13 14 14 15 16 16 16 16 16 16 16 16 16 16 16 16 16	802 658 470	0.045 0.035 0.022	168 129 94
Qæ	Sputalk 5 196	1960 1	1960 Aug. 19.36 1.1 days 1960 Aug. 20.5	Cyl inder 4600	6 long? 2 dia?	1960 Aug. 19.4		64.95	22.06	8899	762	324	0.002	09
Ω	Sputnik 5 196 rocket	196012	1960 Aug. 19.36 35.2 days 1960 Sep. 23.57	Cylinder? 20007	10 long? 2 dla?	1960 Aug. 19, 1960 Sep. 10, 1960 Sep. 19	19.4 10.0 19.9	6,49	90.7	6687 6653 6604	52 52 53 53 54 54 54 54 54 54 54 54 54 54 54 54 54	25 88 28	0.002	81 22 67
A	Discoverer 15 1960 µ	<b>1</b>	1960 Sep. 13.93 34.2 days 1960 Oct. 18.1	Cone-cylinder 1st day 863, then 710	6 long 1.5 dia.	1960 Sep. 14.0 1960 Oct. 3.0 1960 Oct. 14.0		80°90 80°90 80°90	94.23 92.00 90.00	6858 6749 6651	961 981	25 Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	0.026 0.026 0.014	96 55
	Courier 1B 196	1960 v 1	1960 Oct. 4.74 1000 years	Sphere 230	1.30 dia.	1.30 dia. 1960 Oct. 4	78 -78	28.33	106.85	3/1/65	938	1237	0-020	11
	Courier 1B 1960 rocket	1960 \$2	1960 Oct. 4.74 500 years	Cylinder 450	5.3 long 1.40 dia.	1960 Oct. 4	4.8	28.30	106.38	17772	91/6	1184	0.016	41
	<b>Explorer</b> 8 196	1960 ξ1	1960 Nov. 3.22 60 years	Double cone	0.76 long	0.76 long 1960 Nov. 3.	3.3	19.95	112.69 112.24	731	417	<b>2288</b> 2250	0.121	52 255
	Explorer 8 1960 rocket	1960 <b>ξ</b> 2	1960 Nov. 3.22 30 years	Cylinder 5	1.75 long 0.15 dia.	long 1960 Nov. 3, dis. 1964 Aug. 3,	3.5 45	96.61	112,68	1677	417	2288	0.121	32 12
	Fragments 1960 & 3-4	£3-4												

Year of launch 1960, continued

1960 Nov. 12.9 81.70 96.45 6965 190 984 0.057 165 59 1960 Dec. 13.2 81.70 99.35 6668 170 410 0.018 15 15 1960 Nov. 23.5 81.70 90.35 6668 170 410 0.018 15 15 1960 Nov. 23.5 448.57 98.15 7052 619 730 0.008 334 1964 Aug. 1.2 448.57 98.14 7051 609 756 0.009 334 1960 Dec. 1.4 64.97 88.47 6577 166 232 0.005 607 1960 Dec. 2.8 65.00 87.29 6518 140 140 0.031 140 140 0.101 140 1961 Peb. 2.8 85.40 92.0 6749 233 510 0.0051 312 1961 Peb. 2.9 81.48 92.0 6774 663 205 291 0.0051 175 1961 Peb. 2.9 81.48 92.0 6774 653 243 510 0.0051 175 1961 Peb. 2.9 81.48 92.0 6774 933 510 0.0051 175 1961 Peb. 2.9 81.40 92.0 6774 920 651 176 0.001 175 1961 Peb. 2.9 81.40 92.0 6774 920 651 176 0.001 175 1961 Peb. 2.9 81.40 92.0 6774 920 651 178 3324 0.001 175 1961 Peb. 20.9 81.40 92.0 6774 920 651 178 3324 0.001 175 1961 Peb. 20.9 81.40 89.40 6626 205 209 0.001 176 0.001 175 1961 Peb. 20.9 81.40 89.40 6626 205 209 0.001 178 324 0.001 178 175 1961 Peb. 20.9 81.40 89.40 6626 205 209 0.001 178 324 0.001 178 175 1961 Jan. 10.1 81.1 81.40 89.55 6629 178 324 0.001 178 175	Launch date, lifetime and descent date	Launch date, lifetime and descent date	Launch date, lifetime and descent date	ate, and	1	Shape and weight (kg.)	Size (m,)	Date of orbital determination	lon	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Orbital eccen- tricity	Argument of perigee (deg.)
1960 Nov. 23.5 148.5 98.20 7054 619 752 0.008 1960 Nov. 23.5 148.5 98.15 7052 619 750 0.008 1960 Nov. 23.5 148.57 98.14 7051 609 756 0.009 31960 Nov. 23.5 148.57 98.14 7051 609 756 0.009 31960 Nov. 23.5 148.57 98.02 7046 618 717 0.007 31960 Nov. 23.5 148.51 98.02 7046 618 717 0.007 31960 Nov. 23.8 65.00 87.29 6518 140 140 0	Discoverer 17 1960o 1960 Nov. 12,86 Cone-cylinder 8 long 46.9 days 156.0 Dec. 29.8 then 930	1960 Nov. 12.86 Cone-cylinder 46.9 days 1960 Dec. 29.8 then 930	12,86 Cone-cylinder 1st 2 days 1091 29,8 then 930	Cone-cylinder 1st 2 days 1091 then 930	Cone-cylinder 1st 2 days 1091 then 930	8 10	8 long 1.5 dia.				96.45 95.11	6965 6965 6668	8.45	984 668 410	0.057	163 59 15
1960 Nov. 23.5 48.57 98.14 7051 609 736 0.009 3 1964 Sept. 8.8 48.57 98.02 7046 618 717 0.007 3 1964 Sept. 8.8 48.51 98.02 7046 618 717 0.007 3 1960 Dec. 1.4 64.97 88.47 6577 166 232 0.005 1960 Dec. 7.9 81.50 93.66 6830 243 661 0.031 1961 Peb. 5.8 81.48 92.0 6749 233 510 0.0021 1961 Peb. 5.8 81.48 92.0 6798 209 631 0.006 11961 Jan. 16.6 83.40 90.0 6651 186 359 0.013 1761 Jan. 16.6 83.40 90.0 6651 178 324 0.011	Tiros 2 1960 XI 1960 Nov. 23.47 Cylinder 0.4 60 years 130 1.0	1960 Nov. 23.47 Cylinder 60 years 130	23.47 Cylinder 130	Cylinder 130		1.0	0.48 long			-	98,20	7054	619	732	0,008	334
Dec. 1.4 64.97 88.47 6577 166 232 0.005  Dec. 2.8 65.00 87.29 6518 140 140 0  Dec. 7.9 81.50 93.66 6830 243 661 0.031 1  Ret. 29.0 81.48 92.0 6749 233 510 0.021 3  Mar. 29.0 81.48 99.49 6626 205 291 0.006 1  Dec. 20.9 83.40 93.00 6798 209 631 0.031 1  Jan. 16.6 83.40 90.0 6651 186 359 0.013  Jan. 19.1 83.40 89.55 6629 178 324 0.011	Tiros 2 1960 M2 1960 Nov. 23.47 Cylinder 1.50 rocket 23 years 23 0.46	1960 Nov. 23.47 Cylinder 30 years 23	1960 Nov. 23.47 Cylinder 30 years 23	Cylinder 23		1.5	O long 6 dia.				98.14	1502	609	717	0,009	<b>33</b> 4 355
Dec.         1.44         64.97         88.47         6577         166         232         0.005           Dec.         2.8         65.00         87.29         6518         140         140         0           Dec.         7.9         81.50         93.66         6830         243         661         0.031         1           Feb.         5.8         81.48         92.0         6749         233         510         0.021         3           Mar.         29.0         81.48         89.49         6626         205         299         631         0.006         1           Jan.         16.6         83.40         93.00         6798         209         631         0.003         1           Jan.         15.6         83.40         90.0         6651         186         359         0.013         1           Jan.         19.1         83.40         89.55         6629         178         324         0.011         1	Fragments 1960x3-4	0 <b>π</b> 3-4														
Dec.         2.8         65.00         87.29         6518         140         140         0           Dec.         7.9         81.50         93.66         6830         243         661         0.031           Feb.         5.8         81.48         92.0         6749         233         510         0.021           Mar.         29.0         81.48         99.49         6626         205         291         0.006           Dec.         20.9         83.40         93.00         6798         209         631         0.006           Jan.         16.6         83.40         90.0         6651         186         359         0.003           Jan.         19.1         83.40         90.0         6651         178         324         0.013	Sputnik 6 1960p1 1960 Dec. 1.31 Cylinder 6 long? 1 day 4563 2 dia?	1.31 Cylinder 6 4563 2	1.31 Cylinder 6 4563 2	Cylinder 6 4563 2	10 O	2 4	long? dla?	1960 Dec.			88,47	6577	166	232	0,005	607
Dec.         7.9         81.50         93.66         6830         243         661         0.031           Feb.         5.8         .81.48         92.0         6749         233         510         0.021           Mar.         29.0         81.48         89.49         6626         205         291         0.021           Dec.         20.9         83.40         93.00         6798         209         631         0.005           Jan.         16.6         83.40         90.0         6651         186         359         0.003           Jan.         19.1         83.40         89.55         6629         178         324         0.013	Sputnik 6 1960 p2 1960 Dec. 1.31 Cylinder? 10 rocket 1960 Dec. 2.9	1960 Dec. 1.31 Cylinder? 1.6 days 2.9	1960 Dec. 1.31 Cylinder? 1.6 days 2.9	Cylinder? 2000?		0 0	10 long? 2 dla?	1960 Dec.			87,29	6518	140	140	0	1
Dec.         20.9         83.40         93.00         6798         209         631         0.031           Jan.         16.6         83.40         90.0         6651         186         359         0.013           Jan.         19.1         83.40         89.55         6629         178         324         0.011	Discoverer 18 1960 of 1960 Dec. 7.85   Cone-cylinder   8 1   116 days   1st 3 days 1240 1.5	1960 Dec. 7.85 Cone-cylinder 116 days 1961 Apr. 2	7.85 Cone-cylinder 1st 3 days 1240	Cone-cylinder 1st 3 days 1240	9		8 long 1.5 dia.	Dec. Feb.			93.66 92.0 89.49	6830 6749 6626	24,3 23,3 20,5	2010	0.031	164 312 121
	Discoverer 19 1960 <b>c</b> 1960 Dec. 20.86 Cone-cylinder 8 1 33.2 days 1060 1.5	1960 Dec. 20.86 Cone-cylinder 33.2 days 1060	20.86 Cone-cylinder 1060 23.1	Cone-cylinder 1060	Cone-cylinder 1060	1.5	8 long 1.5 dia.	Dec. Jan.			93.00 90.0 89.55	6798 6651 6629	209 186 178	631 359 324	0,031 0,013 0,011	55 55 59

Samos					•						THE RESERVE THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN			
Samos	Nаme		Launch date, lifetime and descent date	late, and date	Shape and weight (kg.)	Size (m.)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Orbital eccen- tricity	Argument of perigee (deg.)
	2	1961 <b>a</b> .1	1961 Jan. 12 years	31,85	Cylinder 1900	7 long 1.5 dia.	1961 Jan. 31.9 1962 Dec. 3.7 1964 Jun. 20.8	04°76 04°16 04°16	8 - 97 8 - 84 17 - 84	6894 6883 6882	124 1991 1475	557 578 578 578	0.006	196 18 197
Samos 2 nose-cap		1961 <b>G</b> L2	1961 Jan. 10 years	31.85	1	1	1961 Jan. 31.9 1962 May -17.5 1964 Jul. 23.5	97.40 97.36 97.40	7 to 25	6894 6882 6880	1271 167 161	557 546 549	0.006	98 88
D Sputnik 7		1961 <b>β</b> 1	1961 Feb. 22.7 days 1961 Feb.	ц.,1 26.8	- 6483	ı	1961 Feb. 4.1	64.95	8888	6643	28	318	0,008	59
D Sputnik 7 rocket		1961 <b>β</b> 2	1961 Feb. 8.9 days 1961 Feb.	13.0	Cylinder?	1	Initial orbit similar to 1961 B 1	milar to 1	961 <b>β</b> 1					
D Fragment		1961 <b>β</b> 3												
Verus	Venus probe	1961Y1	1961 Feb.	12,09	Cylinder 643.5	2.03 long 1.05 dia.	Initial earth-satellite orbit similar to 1961 \$73	tellite or	bit simi	lar to	1961 \$ 3			
D Sputnik 8 rocket		1961¥2	1961 Feb. 6.5 days 1961 Feb.	12.09 18.6	Cylinder?	ı	1961 Feb. 13.9	65.0	89.2	6614;	%	275	900*0	8
D Sputnik 8		1961 7 3	1961 Feb. 13.7 days 1961 Feb.	12,09	58397	1	1961 Feb. 12.1	65.0	89,6	6633	229	282	†/00 <b>°</b> 0	83
D Fragment		1961 7 4												

Argument of perigee (deg.)	100 118 134 26	100		125 36 158		141 244 198	8 8		25	
Orbital eccen- tricity	0.122 0.106 0.118 0.121	0.122		0.036		0,059	0,060	0,005	0.002	
Apogee height (km.)	2583 2443 2506 2258	2589		786 552 303		1069 649 744	1002	239	199	
Perigee height (km.)	634 752 632 394	629		288 267 223		240 239 212	167	173	173	
Semi major axis (km.)	7986 7976 7487 7407	7992		6915 6787 6641		7033 6822 6656	6963	6584	1959	
Nodal period (min.)	118,28 118,04 117,36 112,11	118.4		95.41 92.78 89.91		97.85 93.49 90.19	96.22	88.6	88,2	
Orbital inclina- tion (deg.)	38,86 38,82 38,86 38,95	38,85		80.91 80.84 80.82		89°9'17'8	28,38 28,38	64.93	6,49	
of 11 11on	16.6 19.0 1.0 7.9	16.6		17.9 27.2 12.4		17.5	22,2	9.3	9.6	
Date of orbital determination	1961 Feb. 1961 Dec. 1963 Jan. 1963 Dec.	1961 Feb.		1961 Feb. 1962 Jan. 1962 July		1961 Feb. 1961 Dec. 1962 Apr.	1961 Feb. 1961 Mar.	1961 Mar.	1961 Mar.	
Size (m.)	sphere 3,66 dia,	1.83 long 0.46 dia.		8 long 1.5 dia.		8 long 1.5 dia.	5.16 long	9 long? 3 dia?	ı	
Shape and weight (kg.)	Inflated sphere 6.63	Cylinder 24		Cone-cylinder 1st 4 days 1110 then 980		Cone-cylinder 1100?	Cylinder 600	Cone-cylinder 4700	Cylinder?	
date, ne and t date	16,55	16,55		17.85		18,95	20.16	9.27	9.27	
Launch date, lifetime and descent date	1961 Feb. 1148.2 days 1964 Apr.	1961 Feb.		1961 Feb. 525.9 days 1962 July		1961 Feb. 426.0 days 1962 Apr.	1961 Feb. 36.38 days 1961 Mar.	1961 Mar. 0.1 day 1961 Mar.	1961 Mar.	
	1961 81	1961 & 2	1961 83-4		19616 2-4		1961 ग	196101	1961 0 2	1961 8 3-4
Name	Explorer 9	Explorer 9	Fragments	Discoverer 20 1961 61	Fragments	Discoverer 21 1961 &	Transit 3B- Lofti 1	Sputnik 9	Sputnik 9 rocket	Fragments
	Q	M E	1d	Q	D	Q	D D	O &	D Si F	D F

Year of launch 1961, continued

Argument of perigee (deg.)	ı	742	-	1	168 224 224	112 290 307	E
Orbital eccen- tricity	0,005	†700°0		0.932	0.026	0.086 0.047 0.013	0.085 0.061 0.027
Apogee height (km.)	230	182		181100	25 25 53	1448 843 359	14:22 10:50 551
Perigee height (km,)	164	140		Ø	295 295 268	208 1.24 1.89	200 196 187
Semi major axis (km,)	6575	17759		97050	6851 6823 6734	7206 6897 <b>6648</b>	71 89 7001 6747
Nodal period (min.)	88,42	87.8		5013	98.99 98.99 98.89	131.49 95.03 90.04	101.13 97.19 91.96
Orbital inclina- tion (deg.)	64.9	65.0		33	82,31 82,31 82,26	84.94 88.88 87.82	81.94 81.94 81.87
r 1 tion	25.3	25.9		25.7	9.0 2.4 18.6	24.9 2.5 8.5	24.9 4.8 29.8
Date of orbital determination	1961 Mar.	1961 Mar.		51 Mar.	of Apr.	of Apr. S2 Feb.	of Apr.
ğ	96	196		1961	1961	1961	<u>25 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 </u>
Size (m.)	9 long? 3 dla?	ı		2.72 long 0.48 dia.	8 long 1.5 dia.	0.6 long 0.9 dia.	0.6 long?
Shape and weight (kg.)	Cone-cylinder 4695	Cylinder?		Cyl Ind. –sphere 35	Cone-cylinder 9507	Paraboloid	Frustum
date, e and date	25.25	25.25		25,64	8-75	8.75	8,75
Launch date, lifetime and descent date	1961 Mar. 0.1 day 1961 Mar.	19616.2 1961 Mar. 1.7 days 1961 Mar.		1961 Mar.	1961 Apr. 8.73 373.1 days 1962 Apr. 16.9		1961 Apr. 8.7 154.8 days 1961 Sept. 10.6
	1961 4.1	1961 6 2	1961 63	1961 K	3 1961 21	3 1961 22	3 1961 A 3
Name	Sputnik 10	Sputnik 10 rocket	Fragment	Explorer 10	Discoverer 23 1961 A1   1961 Apr. 373.1 days	Discoverer 23 1961 Apr. 409.4 days capsule 1962 May	D Discoverer 23 1961 A 3 1961 Apr. capsule rocket 154.8 days 1961 Sept.
*************	OK	Q	Q	DS	Q	Ω	Q

A rocket is believed to have separated from Explorer 10.

Year of launch 1961, continued

Name Vostok 1 1961 µ 1  Vostok 1 1961 µ 2  rocket	Launch date, lifetime and descent date	Shape and	92.18	Date of	inclina-	Nodal	_	Perigee	Apogee	Orbital	-
1961 µ 2		weight (kg.)	(m.)	orbital determination	tion (deg.)	period (min.)	axis (km.)	height (km.)	height eccen- (km.) tricit;	>	of perigee (deg.)
1961 µ 2	1961 Apr. 12,25 108 min. 1961 Apr. 12,33	Cone-cylinder 4725	9 long? 3 dia?	1961 Apr. 12.3	64.95	45.68	9620	169	315	0,011	
	1961 Apr. 12.25 4.2 days 1961 Apr. 16.5	Cylinder?	ī	1961 Apr. 12.6	65.07	89,3	6618	161	320	0.012	100
Explorer 11 1961 v	1961 Apr. 27.59	Cylinder 43	2.26 long 0.38 dia.	1961 Apr. 27.6	28.80	107.84	7512	487	1779	980°0	119
Discoverer 25 1961 2	1961 June 16,96 25 days? 1961 July 12?	Cone-cylinder 1000?	8 long 1.5 dia.	1961 June 17.1 1961 July 11.3	82.11 82.11	90.87	7959 1699	222 1.75	409	0.014	178 84
1961 & 2											
Transit 4A 1961 0 1	1961 June 29,18 600 years	Cylinder 79	0.79 long	1961 June 29.2	66.81	103.82	7317	881	866	0.008	319
Greb 3-Injun1 1961 02	1961 June 29,18 900 years	Sphere-cylinder 0.51 dia. 25-16 sphere		1961 June 29.2	66,82	103.85	7319	882	666	0,008	318
Fragments 1961 03-206										**********	
Discoverer 26 1961 A	1561 July 7,98 150.4 days 1961 Dec. 5,4	Cone-cylinder 10007	8 long	1961 July 8,3 1961 Sept.18,4 1961 Nov. 21.3	82.94 82.94 82.94	95.02 93.14 90.39	6896 6805 6670	228 223 242	808 631 372	0.042	160 260 18

continued on Page 14

Year of launch 1961, continued

	The same of the sa		And other Designation of the Person of the P	-		The state of the s	The Party and Personal Property and Personal	Name and Address of the Owner, where		Street, or other Designation of the last o	Seattle Control of the Control of th	Statement of contrast of confessions and contrast of c	The Party Law Street or other Designation of the Party Law Street
	Name	age .	Launch date, lifetime and descent date	Shape and weight (kg.)	Size (m.)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Orbital eccen- tricity	Argument of perigee (deg.)
€	Tiros 3	1961 р 1	1961 July 12,43 100 years	Cylinder 129	0.48 long	1961 July 12,5	47.90	100,33	7156	735	820	900°0	71
	Tiros 3 rocket	1961 p 2	1961 July 12,43 50 years	Cylinder 23	1.50 long 0.46 dia.	1961 July 12.5	6.74	100,31	757	Ot/L	812	0°002	77
	Fragments	1961 p 3-4											
	Midas 3	1961 0 1	1961 July 12,68 100,000 years?	Cylinder 1600	9 long	1961 July 12.7 1962 Oct. 12.9	91.2	16.54	0286 7286	3358	3534	0,009	240
Д	Midas 3 nose-cap	1961 G 2	1561 July 12,68 13,20 days 1961 July 25,88	1		1961 July 15.4 1961 July 18.5	90°80 90°80	117.25	7934	138	2974	0.179	197
	Fragments 1	1961 03-4											
DKZ	Vostok 2	1961 T 1	1961 Aug. 6.25 25.3 hours 1961 Aug. 7.30	Cone-cylinder 4730	9 long? 3 dia?	1961 Aug. 6,3	64.93	94*88	6577	95	232	0°002	1
Ω	Vostok 2 rocket	1961 E 2	1961 Aug. 6.25 3 days 1961 Aug. 9	Cylinder?		Orbit similar to Vostok 2	Vostok 2				ALCOHOLOGICA CONTRACTOR CONTRACTO		
	Explorer 12 1961 v	1961 <b>v</b>	1961 Aug. 16.14 10 years?	Ostagon_# 4 vanes	0.15 long 0.66 dia.	1961 Sep. 22.5 1962 Jan. 30.5	33.43	1591	45190	314	77310	0.852	1 1
Д	Ranger 1	1961 φ 1	1961 Aug. 23.46 6.89 days 1961 Aug. 30.35	Cylinder 306	3.5 long	1961 Aug. 24.1 1961 Aug. 29.5	32.9	90.64	6691	179	780	0.020	506
Ω	Ranger 1 rocket	1961 Ф 2	1961 Aug. 23.46 10.68 days 1961 Sep. 3.14	Cylinder 10007	8 long? 1.5 dia	1961 Aug. 24.1 1961 Aug. 29.5	32.93	90.71	† <del>1</del> 799	52	456	0.021	506
-6										-	Stanfort action and services		

A rocket is believed to have separated from Explorer 12.

Year of launch 1961, continued

	Мате	Launch date, lifetime and descent date	Shape and weight (kg.)	Size (m.)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Apogee Orbital height eccen- (km.) tricity	Argument of perigee (deg.)
Ω	Explorer 13 1961 X	1961 Aug. 25.81 2.3 days 1961 Aug. 28.1	Cylinder 86	1.93 long 0.61 dia.	long 1961 Aug. 26.8 dia.	37.7	97.5	7023	125	1164	4/20°0	1
Di	Discoverer 29 1961 \$	1961 Aug. 30.8 10.2 days 1961 Sep. 9.98	Cone-cylinder 10007	8 long 1.5 dia.	1961 Aug. 31.3	82,14	9.51	6725	152	542	0.029	83
Д'n	Discoverer 30 1961 w 1	1961 Sep.12.83 90.1 days 1961 Dec. 11.9	Cone-cylinder 10007	8 long 1.5 dia.	1961 Sep. 13.6 1961 Nov. 21.5 1961 Dec. 5.5	82 <b>.66</b> 82 <b>.66</b> 82 <b>.66</b>	92.40 90.4 89.4	6769 1599 16821	23.5 21.3 204	373	0.023 0.012 0.006	241
Q	Fragments 1961 w 2-3											
D &	Mercury 4 1961a a1	1961 Sep. 13.59 109 min. 1961 Sep. 13.66	Cone-frustum 1200	2.90 long 1961 1.83 dia.	1961 Sep. 13.6	32.8	4.88	6580	156	248	L00°0	
Q	Mercury 4 1961aa2 rocket	1961 Sep. 13.59 5 hours 1961 Sep. 13.8	Cylinder 3400	20 long	1961 Sep. 13.6	32,85	87.3	6526	147	147	0	
Q	Discoverer 31 1961 ab	1961 Sep. 17.88 38.57 days 1961 Oct. 26.45	Cone-cylinder 1100?	8 long 1.5 dia.	1961 Sep. 21.0 1961 Oct. 10.5	82.70	8.0.8	6693	23.5	326	0,012	136
Dr	Discoverer 32 1961am	1561 Oct. 13.81 30.6 days 1961 Nov. 13.4	Cone-cylinder 1000?	8 long 1.5 dia.	1961 Oct. 14.1 1961 Nov. 10.3	81.69	90.84 88.93	6692	234 207	395	0.012	8.8
Ω	Fragments 1961αγ2-3											

Name 1	HIO	Launch date, lifetime and descent date	Shape and weight (kg.)	Size (m.)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Apogee Orbital Argumeni height eccen- (km.) tricity perigee (deg.	Argument of perigee (deg.)
Midas 4 1961α δ1 1961 Oct., 21.58 Cy		Cy 1	Cylinder 1800?	9 long? 1.5 dia.	1961 Nov. 2.0	95,89	166.01	1000/1	3496	3756	0,013	18
Fragments 1961αδ 2-4	í											
Discoverer 34 1961ac1 1961 Nov. 5,83 Cone-c 396,4 days 1962 Dec. 7,22		Cone -c	Cone-cylinder 11001	8 long 1.5 dia.	1961 Nov. 6.1 1962 June 5.3 1962 Nov.24.7	82.52 82.46 82.46	97.12 94.40 89.91	6998 6863 6642	722 082 1 <b>9</b> 6	1011	0.056	152 149 246
D Fragments 1961 ac 2-5												
Discoverer 35 1961a21 1961 Nov. 15.89   Cone-cylinder 17.9 days 1961 Dec. 3.8		Cone-cy 100	cylinder 10007	8 long 1.5 dia.	1961 Nov. 21.5	81.63 81.63	89.7	6636	238	278	0.003	1 1
Fragment 1961a \( \zeta \)												
Transit 4B 1961ατη1 1961 Nov. 15.93 Cylinder 1000 years 90		Cy110	nder	0.79 long	0.79 long 1961 Nov. 16.6 1.09 dia.	32,43	105.63	7408	956	1104	0,010	329
Traac 1961 CT72 1961 Nov. 15.93 "Door-knob" 800 years 90		*Door-k	-knob**	1.3 long?	1.3 long? 1961 Nov. 21.5	32.43	105.64	601/2	14	1119	0.012	1
Transit 4B 1961 and 1961 Nov. 15.93 Cyll rocket 500 years? 45		Cy11	Cylinder 450?	5.3 long 1.4 dia.	5.3 long 1961 Nov. 21.5	32.41	105.49	7402	246	1105	0.011	ı
		Section of the Party of the Par	Name and Address of the Owner, where									

Year of launch 1961, continued

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	. Матле	Launch date, lifetime and descent date	Shape and weight (kg)	Size (田)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Q	Ranger 2 1961 αθ	1961 Nov. 18,34 2 days 1961 Nov. 20	Cylinder 1300?	11 long? 1.5 dla.	1961 Nov. 18.4 1961 Nov. 19.3	33.34 33.34	88,28	6574	150 145	242 171	0,007	649
DK	Mercury 5 1961at 1	1961 Nov. 29.63 3.3 hours 1961 Nov. 29.77	Cone-frustum 1300	2.90 long 1.83 dia.	1961 Nov. 29.7	32.6	88,3	6575	82.	237	900°0	127
Q	Mercury 5 1961 at 2 rocket	1961 Nov. 29.63 1 day 1961 Nov. 30	Cylinder Moo	20 long 3.0 dia.	Orbit similar to 1961a.1.1	0 1961a L1						
r D	Discoverer 36 1961aK 1	1961 Dec. 12.86 85.3 days 1962 Mar. 8.2	Cone-cylinder 8 long	8 long 1.5 dia.	1961 Dec. 14.7 1962 Jan. 30.5 1962 Feb. 27.5	8 21 8 21 8 15	94.82 90.85 89.60	6741 6691 6636	229 229 24 27 8	484 396 298	0.018	134
Q	0scar 1 1961α κ 2	1961 Dec. 12.86 49.4 days 1962 Jan. 31.3	Rectangular box 0.30 long 5 0.25 wide	0.30 long 0.25 wide	1961 Dec. 14.0 1962 Jan. 16.5 1962 Jan. 30.5	8 8 8 2 2 5	91.76 90.4 88.2	6738 6671 6562	245 226 164	474 359 204	0.017	137
Q	Fragment 1961ax3				á							
Q	[Atlas Agena B] 1961α λ1	1961 Dec. 22.80 235 days 1962 Aug. 14	Cylinder 1800?	8 long? 1.5 dia.	1962 Mar. 13.5 1962 June 5.6 1962 Aug. 3.6	89.6 89.6 89.6	94.1 92.1 89.6	6851 6754 6628	22 <u>4</u> 4 28 28	702 524 299	0.033	111
Q	Fragments 1961α \ 2-3											

1962 β 1 1962 Peb. 8.52 (Cylinder 1.50 long 1962 Peb. 13.5 48.13 101.4 7206 706 951 0.009 1962 β 3-4	24	Ла <b>те</b>	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
2 1962 Peb. 8.52 Cylinder 1.50 long 1962 Peb. 13.5 48.13 101.4 7206 705 951 0.017  14 1962 Peb. 20.62 Cone-frustum 2.90 long 1962 Peb. 20.7 32.54 88.6 6590 159 265 0.008  296 mln. 1962 Peb. 20.82 Cylinder 20 long 1962 Peb. 20.7 32.54 88.6 6590 159 265 0.008  1 982 Peb. 20.82 Feb. 20.82 3400 3.0 dia. 1962 Peb. 20.8 32.57 88.0 6560 156 208 0.004  1 982 Peb. 21 Gylinder 8 long 1962 Peb. 21 81.97 90.0 6649 167 374 0.016  1 982 Peb. 21 Cylinder 8 long 1962 Peb. 21 81.97 90.0 6649 167 374 0.016  1 982 Peb. 21 Cylinder 1.5 dia. 1962 Peb. 21 81.97 90.0 6649 167 374 0.016  1 1962 Per. 21 Toole-cylinder 8 long 1962 Per. 13.5 82.25 89.0 6536 208 341 0.000  1 1962 Per. 21 Toole-cylinder 8 long 1962 Per. 13.5 82.25 89.0 6536 208 341 0.000  2 1962 Per. 21 Toole-cylinder 1.5 dia. 1962 Per. 13.5 82.28 95.0 6536 208 341 0.000  2 1962 Per. 21 Toole-cylinder 1.5 dia. 1962 Per. 13.5 32.85 95.89 6942 556 570 0.001  2 1962 Per. 21 Toole-cylinder 1.8 long 1962 Per. 13.5 32.85 95.98 6942 6960 0.004 82.001		1962β 1		Cylinder 129	0.48 long 1.07 dia.	1962 Feb. 13.5	148.30	100,31	立た	712	840	0.009	
1962 Feb. 20.62 Cone-frustum 2.90 long 1962 Feb. 20,7 32.54 88.6 6590 159 265 0.008  296 min. 296 min. 2.90 long 1962 Feb. 20,8 32.57 88.0 6560 156 208 0.004  1962 Feb. 21 Cylinder 20 long 1962 Feb. 21 81.97 90.0 6649 167 374 0.016  1962 Feb. 21 Cylinder 8 long 1962 Feb. 21 81.97 90.0 6649 167 374 0.016  1 1962 Feb. 27.91 Cone-cylinder 8 long 1962 Her. 13.5 82.23 90.04 655 208 341 0.010  21 days 10007 1.5 dia. 1962 Her. 13.5 82.23 90.04 655 208 341 0.010  1 1962 Her. 2.7  2 1962 Her. 7.67 Nonagonal box 0.94 long 1962 Her. 13.5 32.85 95.98 6950 544 600 0.004  2 1962 Her. 7.67 Cylinder 1.8 long 1962 Her. 13.5 32.85 95.98 6950 544 600 0.004	Tiros 4 rocket			Cylinder 23	1.50 long 0.46 dia.	1962 Feb. 13.5 1963 Dec. 15.5	48.13	101.4 101.3	7206	305	25.5	0.017	1 1
1962 Feb. 20.62   1.63 dla.   1.63 dla.   1.62 Feb. 20.7   32.54   88.6   6590   159   265   0.008   296 min.   1352   1.63 dla.   1.63 dla.   1.62 Feb. 20.7   32.57   88.0   6560   156   208   0.004   1.64 min.   1.65 min.   1.64 min	Fragments	1962 β 3-4											
1962 Feb. 20.62 Cylinder 20 long 1962 Feb. 20.8 32.57 88.0 6560 156 208 0.004 1 day 1962 Feb. 21	Mercury 6 (Friendship		1962 Feb. 20.62 296 min. 1962 Feb. 20.82	Cone-frustum 1352	2,90 long 1,83 dia.	1962 Feb. 20.7	32,54	988.6	96590	159	265	0°008	8
16 days 21 days 21 days 21 days 21 days 21 days 21 days 22 days 23 days 24 days 24 days 24 days 25 day 26 day 26 day 26 day 27	9 6	1962 Y 2	1962 Feb. 20.62 1 day 1962 Feb. 21	Cylinder 3400	20 long 3.0 dia.	1962 Feb. 20.8	32,57	88.0	9959	156	808	†/00°0	ਲੋ
1962 E 1 1962 Peb. 27.91 Cone-cylinder 1.5 dia. 1962 Mar. 13.5 82.23 90.04 6653 208 341 0.010 1962 E 2-4 1962 Mar. 7.67 Nonagonal box 200 1.12 dia. 1962 Mar. 13.5 32.85 95.98 6942 556 570 0.004 1962 Z 2 1962 Mar. 7.67 Cylinder 1.8 long 1962 Mar. 18.3 32.83 95.98 6950 544 600 0.004	erer 3	177 1962 8	1962 Feb. 21 16 days 1962 Mar. 9	Cylinder 10007	8 long? 1.5 dia.		81.97	0.08	64799	167	374	0.016	1
1962 & 2-4   1962 Mar. 7.67   Nonagonal box   0.94 long   1962 Mar. 13.5   32.85   95.89   6942   556   570   0.001   1.12 dia.   1962 & 2   1962 Mar. 7.67   Cylinder   1.8 long   1962 Mar. 18.3   32.83   95.98   6950   544   600   0.004	erer 3	8 1962 € 1		Cone-cylinder 10007	8 long 1.5 dia.	1962 Mar. 9.8 1962 Mar. 13.5	82.23		6653 663 <b>6</b>	208	341	0,010	98
1962 % 1 1962 Mar. 7.67 Nonagonal box 0.94 long 1962 Mar. 13.5 32.85 95.89 6942 556 570 0.001  1962 % 2 1962 Mar. 7.67 Cylinder 1.8 long 1962 Mar. 18.3 32.83 95.98 6950 544 600 0.004	Fragments	1962 € 2-4											
1962 Mar. 7.67 Cylinder 1.8 long 1962 Mar. 18.3 32.83 95.98 6950 544 600 0.004		1962 & 1	1962 Mar. 7.67 30 years	Nonagonal box 200	0.94 long	1962 Mar. 13.5	32.85		2469	556	570	0.001	1
	Oso 1 rocket	1962 \( \ 2	1962 Mar. 7.67 15 years	Cylinder 24	1.8 long 0.46 dia.	1962 Mar. 18.3	32,83		0569	吉	-	†00°0	203

Space vehicle: Ranger 3, 1962 a

Year of launch 1962, continued

	COLUMN CONTRACTOR DE CONTRACTO	STREET, SQUARE, STREET, SQUARE, SQUARE	The state of the s	STATE OF THE PERSON NAMED IN COLUMN NAMED IN C	The second name of the second	The state of the s			Name and Address of the Owner, or other Designation of the Owner, where the Owner, which the Owner, where the Owner, which th	The state of the s		The state of the s	the state of the s	1
	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)	
Q	[Atlas Agena B] 1962 m 1	] 1962 m 1	1962 Mar. 7.8 457-1-days 1963 Jur. 7.9	5005	1.5 dia?	1962 Mar. 13.5 1963 Jan. 5.7 1963 May 28.7	90.89 90.87 90.86	93.9 91.57 88.85	6842 6723 6600	251 223 189	676 467 255	0.031	- 104	
Q	Agena rocket	1962 n 3	1962 Mar. 7.8 240.6 days 1962 Nov. 3.4	Cylinder 10007	6 long? 1.5 dia.	1962 May 1.6 1962 July 6.6 1962 Oct. 24.6	90.87 90.87 90.87	93.3 92.4 89.6	681 <i>3</i> 6769 6630	250 228 209	618 553 294	0.027 0.024 0.006	1 1 1	
D	Fragment	1962 TJ 2												
Q	Cosmos 1 (Sputnik 11)	1962 θ 1	1962 Mar.16.50 70 days 1962 May 25	Ellipsoid 400?	1.8 long?	1962 Mar. 16.6 1962 May 1.6 1962 May 25	49.00 48.99 48.99	96.35 92.7 87.9	69 <b>6</b> 4 6788 6552	204 194 175	967 626 175	0.055	104 309	
Q	Cosmos 1 rocket	1962 0 2	1962 Mar.16.50 94 days 1962 June 18	Cylinder ? 1500?	10 long? 2 dia?	1962 Mar. 19.8 1962 May 17.5 1962 June 5.6	49.0 49.0 49.0	96.10 92.6 91.0	6953 6783 6705	206 202 186	943 609 168	0.053	118	
Ω	Cosmos 2 (Sputnik 12)	1962 t 1	1562 Apr. 6.72 499.3 days 1963 Aug.20.0	E111psold 400?	1.8 Long?	1962 Apr. 7 1962 Dec. 22.0 1963 Jul. 28.3	48.97 48.94 48.90	02.25 97.17 90.39	7246 7006 6686	202 195 187	1535 1060 128	0.092 0.062 0.018	906	
Ω	Cosmos 2 rocket	1962 <sup>L</sup> 2	1962 Apr. 6.72 182.7 days 1962 Oct. 6.4	Cylinder? 1500?	10 Jang? 2 dia?	1962 Apr. 10.1 1962 July 16.4 1962 Oct. 3.1	148.94 148.91 148.85	96.69	7230 6982 6652	215 191 169	1488 1015 379	0.088 0.059 0.016	119 147 141	
	Midas 5?	1962 к 1	1962 Apr. 9.66 100,000 years?	Cylinder 2000?	9 long?	1962 May 1.6	86.68	53.03	97,426	2814	3382	0°0°0	ı	
10	Fragments	1962 к 2-4												
Q	[Thor Agena B]	1962 À 1	1962 Apr. 18 40 days 1962 May 28	Cylinder 1500?	8 long? 1.5 dia.	1962 May 1.6 1962 May 17.5	73.48-	89.5	9299	198	1 <del>4</del> 41	0.018	t 1	
Q	Fragments	1962 A 2-4												

Space vehicle: Ranger 4, 1962 µ

	Мяте		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Д	Cosmos 3 (Sputnik 13)	1962 V 1	1 1962 Apr. 24.17 176 days 1962 Oct. 17	Ell£psoid 4007	1.8 Long?	1962 Apr. 24.2 1962 July 18.3 1962 Oct. 10.3	48.99 48.97 48.95	95.8 92.43 89.37	6840 6775 6625	216 214 193	707 580 301	0.036 0.027 0.008	- 126 170
A	Cosmos 3 rocket	1962 V 2	1962 V 2 1962 Apr. 24.17 103.6 days 1962 Aug. 5.8	Cylinder? 1500?	10 <b>lo</b> ng? 2 dia?	1962 Apr. 26.4 1962 July 11.9- 1962 July 29.0	49.00 48.98 48.96	90°98 80°98	4029 4029 4049	20 20 20 20 20 20	699 1440 323	0.035	109 101 183
OK	Cosmos 4 (Sputnik 14)	1962 \( \xi \)	1962 & 1 1962 Apr., 26.42 3 days 1962 Apr., 29	ı	1	1962 Apr. 26.5	65.00	9.06	6299	285	317	0.002	1
Д	Cosmos 4 rocket	1962 \ \ \ 2	1962 & 2 1962 Apr. 26.42 52.5 days 1962 June 17.9	Cylinder? 1500?	10 long? 2 dia	1962 Apr. 30.4 1962 June 8.9 1962 June 15.6	6.45.65 6.45.65 6.45.65	90.52 89.28 88.6	6679 6615 6584	287 233 205	314 240 207	0.002 0.001 0	174 146
Q	Fragment	1962 € 3											
↔	Ariel 1	1962 0 1	1962 0 1 1962 Apr. 26.75 20 years	Cylinder + 4 paddles 60	0.53 long 0.58 dia.	1962 Apr. 28.5 1962 Aug. 18.6 1964 Aug. 12.5	52.58 58.88 88.88	100.86 100.81 100.50	77.73	389 382 383	1214 1216 1185	0.057 0.058 0.056	171 89 17
	Ariel 1 rocket	1962 0 2	1962 0 2 1962 Apr. 26.75 15 years	Cylinder 24	1.8 long 0.46 dia.	1962 May 17.5 1964 Aug. 23.6	53.84 53.84	100.9	7182	394 385	1213	0.057	103
_	D [Atlas Agena B] 1	1962 π	1962 Apr. 26.9 2 days 1962 Apr. 28	Cylinder 2000?	8 long? 1.5 dia.	Orbit unknown					terne di transcolori		
	D [Thor Agena B] 1	1962 p 1	1962 p 1 1962 Apr., 28,95 28 days 1962 Pay 26	Cylinder 15007	8 long? 1.5 dia.	1962 May 1.6 1962 May 17.6 1962 May 25.6	73.11 73.07 73.07	91.1 89.90 88.7	6706 6588 6588	180 176 166	475 362 253	0.022	. đ.
	Fragment 1	1962 р 2											

Year of launch 1962, continued

	Name		Leumon date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nocal period (min)	Semi major axis (km)	Perigee Apogee height (km) (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Q	[Thor Agena B]	196201	1962 May 15,82 560,0 days 1967 Nove, 26,8	Cylinder 15007	8 long?	1962 May 20.6 1962 Dec. 11.7 1963 Oct. 17.5	82,33 82,33 82,32	94.02 93.03 90.55	6848 679 <b>5</b> 6680	305 287 248	534 355	0.024 0.019 0.008	148 131 56
Q	Pragments 1	196901											
OKE	Mercury 7 (Aurora 7)	1962T1	1962 May 24.53 296 min. 1962 May 24.74	Cone-frustam	2.90 long	1962 May 24.6	32,5	88.5	6585	立	560	0,003	1
A	Mercury 7 rocket	1962T 2	1562 May 24.53 1 day 1962 May 25	Cylinder 3400	20 long	Orbit similar to 196271	196241						
Ω	Cosmos 5 (Sputmik 15)	1962 11	1962 May 28.13 359.6 days 1963 May 2.7	Ellipsoid	1.8 leng?	1962 May 28,2 1962 Nov. 28,8 1963 Mar. 15,1	49.06 49.00 48.96	102.75 97.41 92.89	7267 7019 6808	8,181	158 <b>7</b> 1095 217	0.096	112 104 205
Q	D Cosmos 5 rocket	1562 102	1962 May 28,13 201 days 1962 Dec. 15	Cylinder? 1500?	10 long? 2 dia?	1962 May 29.5 1962 Sept 4.3 1962 Nov. 24.5	45.1 45.01 48.98	102,67 99,06 92,69	3522 3602 3602 3613 3613	56 42 181 181	1757 5451 748	120°0 140°0 160°0	116 129 113
Q	D [Thor Agena B]	1962φ1	1962 Hay 30,02 12 days 1962 June 11	Cylinder 15007	8 long?	1962 June 5.5	74.10 74.10	89.7 88.96	6633	199	319 248	0°000	. ~
A	Fragment	1962 p 2											

Year of launch 1962, continued

Q

Q

Na <b>me</b>	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital ircline- tion (deg)	Nodal period (min)	Semi major axis (km)	Semi Perigee Apogee major height height (km) (km)	Apogee he <b>ight</b> (km)	Orbital eccen- tricity	Argument of lerigee (deg.)
[Thor Agena B] 1962 % 1	1962 June 2,03 26,9 days 1962 June 28,9	Cylinder 15007	8 Long? 1.5 dia.	1962 June 5.5 1962 June 19.5 1962 June 25.4	4 28 4 25 4 25	90.5 89.60 88.87	6676 6632 6596	12 55 885 885	385 315 247	0,013 0,009 0,004	, 216
0scar 2 1962 %2	1962 June 2,03 19 days 1962 June 21	Rectangular box? 5	0,30 long? C,25 wide?	1962 June 2,9	74.27	90.55 89.3	6679	207	394 285	0.007	133
Fragment 1962 X3					-			00 Maria de 10 Maria (10 Maria 10 Mari			
[Atlas Agama B] 1962 🌵	1962 June 17 1 day 1962 June 18	Cylinder 2000?	8 long? 1.5 dia.	Orbit unknown							
[Thor Agena B] 1962w1	1962 June 18,85 498,1 days 1963 Oct. 30,0	Cylinder 15007	8 long? 1.5 dia.	1962 June 22,6 1962 Dec. 17,7 1963 Oct., 26,8	82,14 82,12 82,10	92.4 91.86 88.69	6769 6738 6583	378	411 375 211	0.003	336
Fragments 1962 w2-3								Part out Prost's Load			
Tiros 5 1962 a a 1	1962 June 19,51 100 years	Cylinder 129	0,56 long 1,07 dia,	1962 July 13.4	58.08	100,44	7159	588	416	0,027	121
Tiros 5 1962 C.C.2 rocket	1962 June 19,51 50 years	Cylinder 23	1.50 long 0.46 dia.	1962 July 17.5	58.08	100.4	7157	586	972	0,027	1
Fragments 1962003-4											
[Thor Agena B] 1962 a, β	1962 αβ 1962 June 23.02 14.7 days 1962 July 7.7	Cylinder 1500?	8 long? 1.5 dia.	1962 June 27.5	75.09 75.09	89.58 88.82	6631	203	293	0,001	140

Q

Year of launch 1962, continued

	Матте		Launch date, lifetime and descert date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal Ferior (min)	Semi major axis (km)	Perigee Apogre height height (km) (km)	Apogre height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Q	[Thor Agena D] 15	1962ar	1962 June 28,05 78 days 1962 Sept 14	Cylinder 15007	8 long? 1.5 dla.	1962 July 3,5 1962 Aug. 20,4 1962 Sept 8,4	76°04 76°04 76°01	93.66 91.24 89.48	6828 6713 6619	21.1 187 176	689 482 305	0,035 0,022 0,010	358 29 <b>7</b>
Q	Cosmos 6 1962 (Sputnik 16)	1562 a 81	1962 June 30,67 70 days 1962 Sept 8	E111pse1d 4007	1.2 dia?	1962 July 1.0 1962 Aug. 9.5 1962 Aug. 26.1	48.96 48.96 48.95	90°54 89°54 89°46	6683 6652 6628	198 178 178 178	368	0,006 0,004 0,001	72 258 358
А	Cosmos 6 1962	1962αδ2	1962 June 30.67 38.5 days 1962 Aug. 8.2	Cylinder? 1500?	10 leng? 2 dia?	1962 July 1.0 1962 July 21.5 1962 Aug., 1.6	48.97 48.97 48.95	90°49 89°86 89°22	2199 6499 6419	25 <del>14</del> 25	\$ 20 80	0,006	150
	Telstar ( 1962	1962 a E 1	1962 July 10,36 10,000 years	Sphere 77	0,86 dia,	1962 July 10.4	62.44	157.65	0296	952	5632	0,242	165
	Telstar 1 1962 rocket	1962 a.e. 2	1962 July 10,36 3000 years	Cylinder 23	1.5 long 0.46 dia.	1962 July 17.5	87.044	157,53	1996	746	5625	0,242	176
Q	Atlas Agene B∫1962α≾1	2021	1962 July 18.87 9 days 1962 July 27	Cylinder 20007	8 long? 1.5 dia.	1962 July 22,2 1962 July 24,6	96.12 96.12	88.75	6588	18. 15.	23.6	0,004	712
A	Pragment 19620	1962a, \ 2											
Ω	Thor Agena BJ 1962 G. m	297	1962 July 21.04 24 days 1962 Aug. 14	Cylinder 1500?	8 long? 1.5 dia.	1962 July 21,2 1962 Aug. 4,1 1962 Aug. 12,8	82 82 82 82 82 82	90°42 89°69 88°42	6675 6637 6574	208 176 176	381 325 216	0,013	155 129 122
А	Thor Agena B] 1962 G, 0	2 ¢ 0	1962 July 28,02 27 days 1962 Aug. 24	Cylinder 15007	8 long?	1962 July 28,2 1962 Aug. 16,6 1962 Aug. 21.7	7.09	90°69 88°99	6684 6637 6599	22 24 88	385	0,012	155
									1			-	

continued on page 24

Argument of perigee (deg)	847	6 <b>7</b> 58 52		149 88 K					1 1 1	141
Orbital eccen- tricity	0,012	0,010		0,016		0	0,004	0	†00°0	700°0
Apogee height (km)	356	はなど		418 332 232		205	22 24 27 24 27 24 24 24 24 24 24 24 24 24 24 24 24 24	151	215	22
Perigee height (km)	197	208 138 171		204 199 179		205	35 52 52 35 52 52 36 52 56 56 56 56 56 56 56 56 56 56 56 56 56	151	165 159 159	169
Semi major axis (km)	6655	6653 6622 6582		†859 ††899		6583	6570 6566 6561 6551	6529	6573 6563 6563	6573
Nodel period (min)	90°08	90,00 89,38 88,56		90.77 89.85 88.64		88,62	88.24 88.24 88.13 87.97	87.5	88,39 88,26 88,18	86.38
Orbital inclina- tion (deg.)	64.95	96 ° 13 73 73 73 73 73		នុ នុ ន ស ស ស		96.30	86° 49 86° 49 86° 49 86° 49	<b>64.</b> R2	4.9 9.9 9.9 9.9	08 <b>*</b> 19
Date of orbital determination	1962 July 30 <sub>0</sub> 3	1962 July 30 <sub>9</sub> 3 1962 Aug. 12 <sub>0</sub> 1 1962 Aug. 18 <sub>0</sub> 8		1562 Aug. 3,2 1962 Aug. 17.7 1962 Aug. 21.8		1962 Aug. 6.0	1962 Aug. 11.5 1962 Aug. 12.8 1962 Aug. 13.8 1962 Aug. 15.2	1962 Aug. 13.0	1962 Aug. 12,4 1962 Aug. 13,8 1962 Aug. 14,8	1962 Aug. 13.0
Size (m)	ŧ	10 leng? 2 dia?		8 long? 1.5 dia.		8 long? 1.5 dia.	9 long? 3 dia.?	1	9 long?	ı
Shape and weight (kg)	·	Cylinder? 1500?		Cylinder 15007		Cylinder 2000?	Cone-cylinder 4730	Cylinder?	Cone-cylinder 4750	Cylinder?
Launch date, lifetime and descent date	1562 July 28,39 4 days 1962 Aug. 1	1562 July 28,39 24 days 1962 Aug. 21		1962 Aug. 2,02 24 days 1562 Aug. 26		1962 Aug. 5.75 1 day 1962 Aug. 6	1962 Aug. 11,35 3,94 days 1962 Aug. 15,29	1962 Aug. 11.35 2.7 days 1962 Aug. 14.1	1962 Aug. 12,33 2,96 deyrs 1962 Aug. 15,29	1962 Aug. 12,33 2,4 days 1562 Aug. 14,7
Мате	1962ali	1962a.t.2	1962a13-4	D [Thor Agena D] 1962 απ1	1962 aK2	D [Atlas Agena B]1962αλ	1962 aµi	1962 apr	1962av1	1962 av2
	D Cosmos 7 R7 (Sputnik 17)	D Cosmos 7	D Fragments	D Thor Ager	D Fragment	D [Atlas Age	D Vostok 3	D Vostok 3 rocket	D Vostok 4	D Vostok 4 rocket

Year of launch 1962, continued

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	Name		Launch date, lifetime and descent date	Shape and weight (kg.)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodel perfod (min)	Semi major axis (km)	Perigee height (km)	Apogee he ight	Orbital eccen- tricity	Argument of perigee (deg)
Ω	Cosmos 8	1962a.51	1962 Aug. 18,21 364,7 days 1963 Aug. 17,92	Ellîpsoid? 400?	1.8 long?	1962 Aug. 18,3 1963 Jan. 14.1 1963 Aug. 14.9	48,97 48,96 48,95	92.93 91.94 88.26	6799 6751 6571	244 238 173	598 508 2 <b>13</b>	0.026 0.020 0.003	121 25 4.5
Ω	Cosmos 8 rocket	1962a E2	1962 Aug. 18,21 123,3 days 1962 Dec. 19,5	Cylinder? 15007	to long? 2 dla?	1962 Aug. 19.7 1962 Oct. 14.7 1962 Nov. 29.0	48,98 48,98 48,96	92.92 91.95 90.50	6799 6752 6681	251 245 232	591 502 373	0.025 0.019 0.011	132 31 246
	Blue Scout	1962 ao1	1962 Aug. 23,49 20 years	- 609	1	1962 Aug. 23.5 1963 Dec. 31.4	98 <b>,</b> 66	99 <b>.</b> 62	7117	620	858	0.017	240 183
	Altair rocket	1962a of	1962 Aug. 23.49 20 years	Cylinder 24	1.5 long 0.46 dfa	1962 Oct. 10.5	98° 68	99.66	715	615	858	0.017	Ι.
	Fragments	1962do 2-3											
Q	Sputník 19?	1962un1	1962 Aug. 25.12 3 days 1962 Aug. 28	í	1	1962 Aug. 25.9 1962 Aug. 27.0	64, 88 64, 88	88 <b>.</b> 75	6590	158	252	900.0	8 '
Q	Sputnik 19 rocket?	1962an 2	1962 Aug. 25,12 8 days 1962 Sep. 2	å	1	1962 Aug. 25.9 1962 Aug. 31.0	64, 89 64, 89	89,38 88,63	6623 6585	178	311	0.000	8 '
Q	Fragments	19620073-8	The second										
Q	[Thor Agena D] 1962 ac	) 1962 av	1962 Aug. 29.05 12 days 1962 Sep. 10	Cylinder 15007	8 lorg?	1962 Aug. 30.1 1962 Sep. 7.4	65,23 65,23	90,38	6608	187	400 289	0°01 6 0°00 0	182
Q	Sputnik 207	1962aT1	1962 Sep. 1 5 days 1962 Sep. 6	ı	1	1962 Sep. 1	657	905					
Q	Fragments 1	1962ar2-4											

Space Vehicle: Mariner 2,1962 d.p

Continued on Page 26

Year of Launch 1962, continued

	4	the state of the last of the l	Name and Address of the Owner, where the Owner, which is the Owner, where the Owner, which is th	THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OF THE OWNER OWNER, THE OWNER OWNER, THE OWNER OWNER, THE OWN										
[Thor Agena B] 1962 a p 1962 a p 1962 sep. 1.86   Cylinder   1.5 dia.   1962 Sep. 9.2   82.80   94.12   6862   300   669   0.007   Sputnik 27   1962 ap   1962 sep. 12.07      1962 Sep. 13.5   64.87   887   6584   279   492   0.006   Sputnik 27   1962 ap   1962 Sep. 12.07      1962 Sep. 19.5   64.87   887   6584   279   492   0.005    [Thor Agena B] 1962 a x   1962 ap   18.27   1962 Sep. 17.99   1962 Sep. 18.37   19	***	Ма <b>те</b>		Isunch date, lifetime and descent date	Shape and weight (kg.)		Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)		Perigee height (km)	Apogee height (km)	Orbital egcen- tricity	Areument of perigee (deg.)
Sputnik 217         1962 Gap, 13 of 2 days         -         -         1962 Bep, 13 of 2 days         1767<	Q		1962 a 🐧	1962 Sep. 1.86 785.54 days 1964 Oct. 26.40		8 long?		82, 82 82, 80 82, 79	94.42 92.39 90.65	6863 6764 6684	300 279 266	669 492 346	0,027 0,016 0,006	139 207 35
Pragments   1962α.φ 2-7   Fragments   1962α.φ 2-7   1962 δ 2-7   19			1962αφ1	1962 Sep. 12.07 2 days 1962 Sep. 14	ı	1		64, 87	887	65547	176?	176?	8	
[Thor Agena B] 1962αχ [1502 αχ [1502 αχ [1503] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1504] [1506 ατ. 17.6 [11.8] [1			a \$2-7											
Tiros 6 1962 αψί 1962 αψί 1962 ευρ. 18.37 Cylinder 1.50 long 1962 8υρ. 19.44 58.32 98.75 7076 684 711 0.0002 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Q	[Thor Agena B] 1 (contained TRS)	1962αχ	1962 Sep. 17.99 62.2 days 1962 Nov. 19.2	Cylinder 1508?	8 long? 1.5 dia.	Sep. Oct.	#8° &8 #8° &8	8.8 9.8 1.8	6814 6743 6655	204 156 176	668 533 363	0.034 0.025 0.013	42.
Tiros 6 1962 Cuig 18.37 Cylinder 1.50 Long 1962 Oct., 10.6 58.29 98.7 7076 684 712 0.002 rocket  Fregments 1962 Cuig 18.37 Cylinder 25 years  Fregments 1962 Cuig 1962 Sep. 18.37 Cylinder 1.50 Long 25 years  Fregments 1962 Cuig 1962 Sep. 27.440 Cylinder 10 Long 27 Litial orbit similar to 1962 Cuig 1962 Bep. 27.440 Cosmos 9 1962 Cuig 1962 Bep. 28 Cylinder 1500			1962 a ht		Cylinder 127	0.56 long 1.07 dia.	1962 Sep. 19.4	58,32	98.73	9202	684	117	0,002	102
Fregments 1962ct 1/3-4 Cosmos 9 1962ct 1/4 Cosmos 9 1962ct 2 Sep. 27-40 Cylinder? Tocket 1962 at 3 Sep. 28 Sep. 28 Sep. 28 Sep. 27-40 Cylinder? Tocket 1962 at 3 Sep. 27-40 Cylinder? Tocket 1962 at 3 Sep. 27-40 Cylinder? Tocket 1962 at 3 Sep. 27-40 Cylinder? 2 dia? Fragments 1962 at 3-8 Sep. 27-40 Cylinder? 2 dia? Sep. 27-40 Cylinder? 2 dia? Sep. 28 Sep. 27-40 Cylinder? 2 dia? Sep. 28 Sep. 27-40 Cylinder? 2 dia? Sep. 28 Sep. 27-40 Cylinder? 2 dia? Sep. 28 Sep. 28 Sep. 28 Sep. 29 Sep. 27-40 Cylinder? 2 Sep. 27-40 Cylinder? 2 Sep. 27-40 Cylinder? 2 Sep. 28 Sep. 28 Sep. 28 Sep. 27-40 Cylinder? 2 Sep. 27-40 Cylinder? 3 Sep. 27-40 Cylinder? 3 Sep. 27-40 Cylinder? 3 Sep. 27-40 Cylinder? 4 Sep. 27-40 Cylinder? 4 Sep. 27-40 Cylinder? 4 Sep. 27-40 Cylinder? 5 Sep. 27-40		9	1962 ault2	1962 Sep. 18.37 25 years	Cylinder 23	1.50 long 0.46 dia.	1962 Oct. 10.6	58,29	7-86	9202	<del>1</del> 89	712	0,002	ı
Cosmos 9 1962aw1 1962 Sep. 27.40			20 क्रें रे-क											
Cosmos 9 1962aw2 1962 Sep. 27.40 Cylinder? 10 long? rocket 86 days 1500? 2 dia? 1962 Dec. 22 Fragments 1962 aw 3-8	DR		THE RESERVE AND DESCRIPTION OF THE PERSON.	1962 Sep. 27.40 4.0 days 1962 Oct. 1.4	1	1		65.0	8,	6657	292	346	†00°0	ı
	Q		1962aw2	1962 Sep. 27.40 86 days 1962 Dec. 22	Cylinder? 1500?	10 long? 2 dia?	Initial orbit si	milar to 19	62 a w 1					
		Fragments' 1962 au	n 3-8											

Year of launch 1962, continued

Name	1962 Ba 1	Launch date, lifetime and descent date 1562 Sep, 29,25 2,000 years	Shape and weight (kg.) Oblate spheroid 144.7	Size (m) (m) 0.86 long 1.07 dia	Date of orbital determination 1962 Sep. 29.7	Orbital inclina- tion (deg.) 80.46	Nodal period (min.) 105.52	Semi major axis (km.)	height (km.)	Apogee height (km.)	Orbital eccentricity of 0002	Argument of perigee (deg.)
	1962βα3⊸4		10007	o long	1.962 Sep. 29.1	7 th-080	105.47	0,60	800	305	0000	956
Thor Agena D	1962 BB	1962 Sep. 29.99 14 days 1962 Oct. 14	Cylinder 15007	8 long? 1.5 dia	1962 Oct. 1.5	65°40 65°40	90,30	2099	283	376	0.013	172 166
	1962 BY 1	1962 Oct. 2,92 10 years?	Octagon + 4 yanes	4 yanes,1.30 long	1562 Oct. 10.6 1963 Dec. 27.5	32,95 42,31	2185 2184.6	55784 55772	281 2558	9 <b>8530</b> 96229	0,881	150
	1962 BY 2	1962 Oct. 2,92 10 years?	Cylinder 24	1.5 long 0.46 dia	Orbit similar to 1962 \$\psi\$ \cdot 1	ο 1962β Υ	-					
	1562 βδ 1	1962 Oct. 3.51 9.22 hours 1962 Oct. 3.89	Cone-frustum 1370	2,90 long	1962 Oct. 3.6	32,55	88.75	6597	153	285	0,010	Ħ.
	1962 βδ 2	1962 Oct. 3.51 1 day 1962 Oct. 4	Cylinder	20 long 3 dia	1962 Oct. 3.6	32,55	88.67	6594	156	275	600°0	42
	[Thor Agena B] 1962βε	1962 Oct. 9,79 37,3 days 1962 Nov. 16,1	Cylinder 15007	8 long?	1962 Oct. 10.8 1952 Oct. 20.7 1962 Nov. 14.6	8 8 8 8 8 8	90.96 90.71 88.37	69698 6569	213	1427 395 212	0,016	% 92 88 88 93 88
	1962 BZ 1	1962 Oct. 17,39 4 days 1962 Oct. 21	ı	ı	1962 Oct. 17.4	65,00	90.2	0999	197	367	0.013	ı
	1962 βζ 2	1962 Oct., 17,39 19 days 1962 Nov. 5	Cylinder? 1500?	10 long? 2 dia?	1962 Oct. 31.7	64° 90	89,06	9099	196	560	0°002	61

Space vehicle: Ranger 5, 1962 Pm

Continued on Page 28

continued
1962,
launch
of
Year

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	Leunch date, lifetime and descent date	Shape and weight (kg.)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km.)	Perigee height (km.)	Apogee height (km.)	Orbital eccen- tricity	Argument of perigec (deg.)
1962 Oct. 2 575.9 days	1962 Oct. 20.16 575.9 days	Ellipsoid 400?	1.8 long	1962 Oct., 28.2 1963 Dec., 30.4	48.97 48.95	95,95	6946 6762	455 234	901	0,048	148 249
1962 Oct. 228.8 days	1962 Oct. 20.16 228.8 days 1963 June 6.0	Cylinder? 1500?	10 long? 2 dla?	1962 Oct. 29.2 1562 Dec. 27.6 1963 May 21.3	48.95 48.95 48.93	5.4 8.63 8.83	6937 6883 679	888	885 784 381	0.047 0.041 C.012	平3.25
1962 Oct. 5 days 1962 Oct.	1962 Oct., 24 5 days 1962 Oct., 29	ı	1	1962 Oct. 25	65?	506					
1962 Oct. 4½ years	1962 Oct. 26.68 4½ years	Cylinder 1500?	9 long?	1962 Oct. 29.5 1964 Aug. 19.5	71.41	147.87	92 <b>6</b> 2 861 9	198	5570 4275	0,290	156 303
1962 Oct.	1962 Oct. 27.97 100 years	Octagon + 4 vanes 1.30 long 45.2 0.74 dia	1.30 long 0.74 dia	1962 Oct. 28.0 1964 Aug. 9.7	18,02	315,20 15353 311,444 15247	15353	313	17640	0.564	137
1962 Oct. 100 years?	1962 Oct. 27.97 100 years?	Cylinder 24	1.5 long 0.46 dia	Initial orbit similar to 1962 $\beta$ $\lambda$ 1	milar to	1962βλ1					
1962 Oct. 5000 years	1962 Oct. 31.34 5000 years	Spherold 161	0,91 long	1962 Oct. 31.8	- 50,14	107.84	7508	1077	11 82	20000	202
1962 Oct.	1962 Oct. 31.34 2000 years	Cylinder 4507	5.3 10ng 1.4 dia	1962 Nov. 7.6	50.13	107.53	7492	1069	1159	900°0	1
1962 Nor.	-	Cylinder 853.5	3.3 long	Initial earth-satellite orbit similar to $1962\beta\nu3$	tellite o	rbit simi	lar to	1962 BV 3	8		
1962 Nov. 1 day 1962 Nov.	2,53	1	1	1962 Nov. 1	65	206	-	2003	3007		1
1962 Nov. 2 days 1962 Nov.		1	ı	Initial earth-satellite orbit similar to 1962 $\beta\nu_3$	tellite o	rbit simi	lar to	1962 B v3			

Year of launch 1962, continued

	Маше	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Seni major axis (km)	Perigee height (km)	Apogee he ight (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Ω	Sputnik 24? 1962βξ 1	1962 Nov. 4,65 1 day 1962 Nov. 5	1	1	Initial orbit similar to 1962 B & 3	imilar to 1	962 B & 3					
Д	Sputnik 24 1962 BE 3 rocket?	1962 Nov. 4.65 76 days 1963 Jan. 19	Cylinder? 1500?	10 rong? 2 dia?	1962 Nov. 5,4 1962 Dec. 1,3	64.7 64.7	92°12 91°18	6772	191 281	590	0,029	355 355
Q	Fragments 1962 \$\xi2,4,5		and the second second							V		
Q	[Thor Agena B] 1962 βο	1962 Nov. 5.93 27 days 1962 Dec. 3	cylinder 15007	8 long? 1.5 dla	1962 Nov. 7.7 1962 Nov. 29.2	74.98	90.71 89.02	6687	208	409	0,006	150
Д	[Atlas Agena B] 1962 βπ	1962 Nov. 11.85 1 day 1962 Nov. 12	Cylinder 20007	8 long?	1962 Nove 12.0	00*96	88. 6F.	6584	506	506	0	ı
Q	[Thor Agena B] 1962 βρ	1962 Nov. 24.92 18 days 1962 Dec. 13	cylinder 15007	8 long? 1.5 dia	1962 Nov. 27.0 1962 Dec. 4.3	65.14	89,92 89,63	6649	700	337	0,010	145
Ω	[Thor Agena D] 1962 βσ	1962 Dec. 4,90 3 days 1962 Dec. 8	Cylinder 15007	8 long? 1.5 dia	1962 Dec. 5.1 1962 Dec. 7.0	65.1	89.16 88.40	6574	194	25	700°0	42. 523
								1				

Continued on Page 30

Year of launch 1962, continued

ង្គិត											
-	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	urbital inclina- tion (deg.)	Nodal period (min.)	major axis (km)	Perigee height (km)	Apogee height (km)	Crbital eccen- tricity	Argument of of perigee (deg.)
[Thor Agena D] 1962 \( \begin{array}{c} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1962 Dec. 13.17 4 years	,	1	1962 Dec. 17.0 1964 Aug. 21.3	70,36 70,36	116.26 109.75	7887 7593	23.2	2786	0.150	145 157
1962 pt 2 196	1962 Dec. 13.17 7 years	Sphere 48	0.61 dia	1962 Dec. 13.7	70.38 70.34	116,32	7888	235	2785	0.162	149 233
[Thor Agena D] 1962 \( \beta \tau \) 300   200   196	1962 Dec. 13.17 200.8 days 1963 July 2.0	ı	1	1962 Dec. 16.5 1963 Mar. 9.7 1963 Apr. 21.1	70.33	115.89 108.94 101.83	787 7564 2227	8 8 8 83 2	2763 2147 1465	0,161 0,127 0,086	146 53
196	[Thor Agena D] 1962 βτ 4, 1962 Dec. 13.17	ī		1962 Dec. 16.5 1964 Aug. 18.8	70.34	116.24 106.25	7886	231	2 <b>784</b> 1878	0.162	146 136
5   196	[Thor Agena D] 1962 \(\beta\tau = 1962 \) Dec. 13.17	ı		1962 Dec. 19.5 1964 Aug. 9.5	70.34	116.22	7885	<b>8</b> 83	2 <b>785</b>	0.162 0.130	145
6 1	1962 pr 6 1962 Dec. 13.17 6 years	Cylinder 1200?	6 long? 1.5 dia	1962 Dec. 28.6 1964 Aug. 6.9	70.36	116,3	7889	27.8	2774	0.160	189
100	1962 \$ v1   1962 Dec. 13,98	Octagonal prism 78	0.81 long	1962 Dec. 14,0	64°24	185,01	10759	1322	7439	0.284	178
50,6	1962 \( \beta \) v 2   1962 \( \beta \) bc. 13.98   50,000 \( \text{years?} \)	Cylinder 23	1.8 long 0.46 dia	1962 Dec. 20.0	47.45	184.71	10750	1345	8652	0.282	184
[Thor Agena D] 1962 日本 1962 日本 1966 1966 1966 1966 1969 1969 1969 196	1962 Dec. 14,89 25,0 days 1963 Jan., 8,9	Cylinder 1500?	8 long? 1.5 dia	1962 Dec. 15.8 1962 Dec. 27.8 1963 Jan. 4.5	70°97 70°95 70°95	90 <b>.</b> 46 89.85 89.08	17299 17299	95 155 87	392 336 274	0.014 0.011 0.007	<u> </u>

Year of launch 1962, continued

	Name	Q)	Launch date, lifetime and Gescent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
	Explorer 16 1962 βχ	1962 βχ	1962 Dec. 16,61 1000 years	Cylinder 100.8	1.93 long 0.61 dia	1962 Dec. 16.6	52,01	104,032	14167	750	1181	0,029	142
	Transit 5A	1962 βψ1	1962 Dec. 19.06 60 years	0ctagon+4 vanes 0.50 long + boom 61 0.30 dla	0.50 long	1962 Dec. 20.0	90.62	99,12	2090	869	725	0,002	353
-	Transit 5A rocket	1962 β₩3	1962 Dec. 19.06 60 years	Cylinder 23	1.8 long 0.46 dla	1962 Dec. 20.7	47.06	99,11	7089	869	723	0,002	ı
	Fragments	1962 β\$ 2,4											
D R?	Cosmos 12	1962 Bw 1	1962 Dec. 22,39 8 days 1962 Dec. 30	ı	ı	1962 Dec. 22.4	65.0	90°45	67.29	198	392	0,015	ı
Q	Cosmos 12 rocket	1962 Bw 2	1962 Dec. 22,39 31 days 1963 Jan. 22	Cylinder? 1500?	10 long? 2 dia?	1963 Jan. 2.6	64°34	90.17	9999	197	370	0,013	1

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Мате		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee . height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Sputnik 25? 19	1963-01A	1963 Jan. 4.3 1 day 1963 Jan. 5	t	1	Orbit unknown							
Fragments 1963 [Thor Agena D] 15	1963-01B-C 1963-02A	1963 Jan. 7.88 16.3 days	Cylinder 1500?	8 long?	1963 Jan. 7.9	82,23	98.54 51.08	6680	205	353	0.015	178
Fragment.	1 963_02R	1963 Jan. 24.2			Jan	82,19	88,92	6289	168	257	900*0	126
ena D]	1963-03A	1963 Jan. 16,92 7 years	Cylinder 15007	8 long? 1.5 dia.	1963 Jan. 16.9 1964 Nov. 21.2	81,89	94.66	<b>687</b> 4 6872	459	533	0,005	40
Fragments 1963	1963-03B-C											
Syncom 1 15	1963-04A	1963 Feb. 14.22 > million years	Cylinder 39	0.39 long 0.71 dia.	1963 Feb. 14.2	33,30	1425.5	41944	3423	36739	0,028	276
Syncom 1 15 rocket	1963-04B	1963 Feb. 14.22 100 years?	Cylinder 24	1.5 long 0.46 dia.	1963 Apr. 4.9 1963 Dec. 15.5	33.12 33.12	0.909	23753 23691	252	34498	0.72	165
Blue Scout] 15	1563-05A	1963 Feb. 19.69 20 years	209		1963 Mar. 9.7	100,48	97.79	7026	505	797	0.020	289
Altair rocket 15	1963-05B	1963 Feb. 19.69 25 years	Cylinder 24	1.5 long 0.46 dia.	1963 Feb. 19.7	100,49	97.79	7028	510	789	00000	340
Fragments 1563	1563-050-0											
Cosmos 13 15	1963-06A	1963 Mar. 21.35 8 days 1963 Mar. 29	1	1	1963 Mar. 21.4	64.97	89.77	9699	26	324	0,010	653
Cosmos 13 15 rocket	1963 <b>–0</b> 68	1963 Mar. 21.35 19 days 1963 Apr. 9	Cylinder? 1500?	10 long? 2 dia?	Initial orbit similar to 1963-06A	imilar to	1963-06A					

D R?

Year of launch 1963, continued

	Мате		<pre>launch date, lifetime and descent date</pre>	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Ω	[Thor Agena D]	1963-07A	1963 Apr. 1.92 25.0 days 1963 Apr. 26.9	Cylinder 1500?	8 long? 1.5 dia.	1963 Apr. 2.0 1963 Apr. 10.4	75-40	90 <b>.</b> 66 90.28	6683	198	79£	0.015	158 134
	Luna 4*	1963-08A		1422	ı	Initial earth-satellite	Matellite o	rbit simi 42,000?	orbit similar to 1963-08C   42,0007   409,0007	3-08c 90,000?	7000,007	0.8?	1
Q	Sputnik 26?	1963-080	1963 Apr. 2 1 day 1963 Apr. 3	t	ı	1963 Apr. 2	65?	885					
	Explorer 17	1963-09A	1963 Apr. 3.08 4 years	Sphere 185	0.89 dia.	1963 Apr. 3.1 1964 Oct. 24.6	57.63 57.63	96.40	6964 6885	<b>255</b>	917	0.048	49
Q	Explorer 17 rocket	1963-09B	1963 Apr. 3.08 235.6 days 1963 Nov. 24.7	Cylinder 24	1.5 long 0.46 dia.	1963 Apr. 3.6 1963 May 31.6	57.59 57.59	96.32	6962	247 245	920	0.048	72 -
Q	Cosmos 14	1963-10A	1963 Apr. 13.46 137.6 days 1963 Aug. 29.1	Ellipsoid 4007	1.8 long?	1963 Apr. 13.5 1963 June 2.4	48°95 48°88	92.1 91.29	6754 6722	252	499 43 <b>5</b>	0.018	1 1
Ω	Cosmos 14 rocket	1963-10B	1963 Apr. 13.46 84.2 days 1963 Jul. 6.7	Cylinder? 1500?	10 long? 2 dia?	1963 May 1.0 1963 June 9.0	48°90	91.59	6899	249	7865 384	0,016	202
D R	Cosmos 15	1963-11A	1963 Apr. 22,35 5 days 1963 Apr. 27	ì	ı	1963 Apr. 22,4	65.00	77.68	6637	160	358	0,015	1
Ω	Cosmos 15 rocket	1963-118	1563 Apr. 22,35 9,5 days 1963 May 1,8	Cylinder?	10 long? 2 dia?	1563 Apr. 27.3	64.95	89.19	4199	R .	302	0,010	28
												STATE OF THE PERSON NAMED IN	The state of the last of the l

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\*In the United States, Luna 4 has been designated as 1963-08B and Sputnik 26 as 1963-08A. There is also believed to be a rocket in the Luna 4 orbit.

Year of launch 1963, continued

D Cosmos 16 1963-12A 1963 Agr. 28,40 R? 10 days 1963 May 8 1963 May 8 1963 May 20,7 T Telstar 2 1963-13A 1963 May 7,48 rocket 1963-14A 1963 May 7,48 1963-14A 1963 May 9,84 178 1A 1963-14B 1963 May 9,84	28,40 8 28,40 20,7		ì	orbital determination	tion (deg)	period (min.)	axis (km)	height (km)	height (km)	eccen- tricity	or perigee (deg.)
Cosmos 16 1963-128 rocket  Telstar 2 1963-13A Telstar 2 1963-13B rocket  Midas 67 1563-14A TRS 1A 1963-14B	28.40		ī	1963 Арг. 28.4	65.02	ħ <b>*</b> 06	6999	35	388	0,015	25
Telstar 2 1963-13A Telstar 2 1963-13B rocket Midas 67 1563-14A TRS 1A 1963-14B	7 1.8	Cylinder? 1500?	10 long? 2 dia?	1963 Apr. 30,3	65,02	90°78	ħL99	196	396	0.015	22
67 1963-14A	ears?	Spheroid 79.4	0.94 long 0.86 dia.	1963 May 7.5	12.73	225.05	12267	47.6	10803	0.401	172
67 1563-14A	7.48 ears?	Cylinder 24	1.52 long 0.45 dia.	1963 May 13.3	42.76	224,81	12258	686	107701	0,399	178
1963-148	9,84 ears?	Cylinder 2000?	9 long? 1.5 dia.	1963 May 12,2	87,42	166.48	10020	3604	3680	†00°0	69
50,000 years?		Tetrahedron 0.8	0.17 side	1963 May 15.2	87,35	166,51	10021	3604	3683	†00°0	69
TRS 1B 1963-14C 1963 May 9.84		Tetrahedron 0.8	0.17 side	1963 May 29.2	87,42	166,47	10020	3606	3678	†00°0	đ
Fragments 1963-14D-H											
Needles 1963-14J 1963 May 9.84	9,84 Brs	Annulus 23	20,000 km dia.	1963 Aug 7 19 <b>64</b> Jan 29	87.35	166.46	10005	3379	3915 14197	0.027	180 349

Year of launch 1963, continued

Name								1
	1963-15A	1963-15B	[Thor Agena D] 1963-16A	1963-17A	1963-175	1963-178-F	1963-18B	[Thor Agena D] 1963-19A
Launch date, lifetime and descent date	1963 Nay 15,54 1,644 days 1963 Nay 16,98	1963 Pby 15,54 0,6 days 1963 Pby 16,2	1963 May 18,94 8 days 1963 May 27	1963-17A 1963 May 22,13 2 years	1963 May 22,13 316,7 days 1964 April 2,8	1963 May 24,45 9,0 days 1963 June 2,4	1963 May 24.45 14.6 days 1963 June 8.0	1963 Jun 13.00 29.1 days 1963 Jul 12.1
Shape and weight (kg)	Cone frustum	Cylinder 3400	Cylinder 1500?	E111psold 400?	<b>Cylinder?</b> 1500?	•	Cylinder? 1500?	Cylinder 15007
Size (m)	2.% long	20 long 3.0 dia	8 long?	1.8 long?	10 long? 2 dla?	ı	10 1ang? 2 dla?	8 long? 1.5 dia
Date of orbital determination	1963 May 15.6	1963 May 15.7	1963 May 20.4	1963 May 22,2 1964 Jan. 1,9	1963 May 30.6 1964 Jan. 7.4	1963 May 24.5	1963 May 26.9 1963 June 3.4	1963 Jun 14,4 1963 Jul 10,0
Orbital inclina- tion (deg.)	32,54	32 <b>.5</b> 4	な。た	49.0	49°0 49°0	65.0	65.0	81.87
Nodal period (min)	88.74	88,10	91.12	95.69 93.69	4°-4°	44,68	89.47 88.74	90°67 88°48
Seri major axis (km)	6592	F57	6703	6902	6891	9620	6593	6577
Perigee height (km)	161	167	这	256 256	265	8	198	821
Apogee height (km)	267	23.9	1647	999	761	288	304	419
Orbital eccen- tricity	0,008	†00°0	0,025	0.037	0.036	700°0	0,008	0,017
Argument of perigee (deg.)	1	52	241	107 354	139	1	% %	135

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	Name	Q	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	A pogee he 1ght (km)	Orbital eccen- tricity	Argument of perigee (deg.)
OKE	Vostok 5	1963-20A	1963 June 14,50 4,96 days 1963 June 19,46	Cone-cylinder 4730	9 long? 3 dia?	1963 June 14.8 1963 June 15.5 1963 June 17.5	76°49	88.27 88.2 88.00	6564 6559 6539	383	206	0,004	
Q	Vostok 5 rocket	1963-208	1563 June 14.50 2.0 days 1963 June 16.5	Cylinder?	ı	1963 June 15.9		87,88	7469	<u>8</u>	187	0.003	110
Q	[Thor Agena D]	] 1563-21A	1963 June 15.61 53.4 days 1963 Aug. 8.0	Cylinder 15007	8 long? 1.5 dia	1963 June 16.1 1963 July 13.2	69.87 69.87	95.65 95.47	6924	172	94.6	0,054	87 5
Q	Lofti 2	1963-21B	1963 June 15,61 32,8 days 1963 July 18,4	Spheroid	0.51 dia	1963 June 15.6 1963 July 11.0	48°69 48°69	₽.8°	6926 6713	171	8 E	0.054	152
Q	SR 4	1963 <del></del> 210	1963 June 15,61 46,7 days 1963 Aug. 1,3	Sphere 39	0.61 dia	1963 July 18,3 1963 July 31,3	69.88 69.85	88.92	6751	155	590	0,032	100
Q	Radose	1963-21D	1963 June 15,61 44,9 days 1963 July 30,5		ı	1963 June 28,9 1963 July 26,7	69 <b>.</b> 88	94.37	†† <b>199</b> 9	5,5	857 379	0°048	139 85
Q	[Thor Agena D] 1963-21E	1963-21E	1963 June 15.61 42.1 days 1963 July 27.7		1	1963 June 26.4 1963 July 26.5	69°91 69°87	94.45 88.89	6585	হু মু	& 9g	80000	139
Q	Sureal	1963-21F	1963 June 15,61 19,7 days 1963 July 5,3	1	•	1963 June 17 <sub>6</sub> 4 1963 July 2 <sub>6</sub> 5	69.86 69.81	95 <b>.</b> 26 90 <b>.</b> 34	9069	169	887	0,050	<b>3</b> 5 5
Q	Fragment	1963-21G											
•	Transit [Blue Scout]	1963-22A	1963 June 16,08 50 years?	*Mushroom* + 30 m.bosm 60?		1963 June 16.5	89,97	92.66	7119	trez.	757	0,002	75
	Altair rocket	1963-22B	1963 June 16,08 30 years	Cylinder 24	1.5 long 0.46 dia	1963 June 16.2	90°05	52.66	7119	82	652	0,002	1
	Fragments	1963-22C-D						•					
					The state of the s			-	-	-	-		

Year of launch 1963, continued

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	Маше		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodel period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
D K X	Vostok 6	1963-23A	1963 June 16,40 2,95 days 1963 June 19,35	Cone-cylinder 4713	9 long? 3 dia?	1963 June 16,4 1963 June 17,5	65,09	88 <sub>.34</sub>	6571 6566	168	27.8	†00°0	8,
Q	Vostok 6 rocket	1963-238	1963 June 16,40 1.7 days? 1963 June 18,1?	Cylinder?	1	1963 June 16.8	65.08	88,38	6571	163	223	0,005	92
$\leftarrow$	Tiros 7	1963-24A	1963 June 19,41 50 years	Cylinder 133	0.56 long	1963 June 19 <sub>e</sub> 5	58.23	97.40	7013	8	649	0,002	17
	Tiros 7 rocket	1963-248	1963 June 19,41 20 years	Cylinder 23	1.50 Long 0.46 dia	1963 July 23.14	58.21	97.35	7011	612	659	0,003	<b>Ж</b>
	Fragments	1963-24c-D											
Ω	[Thor Agena D] 1963-25A	1963-25A	1963 June 27,03 29,7 days 1963 July 26,7	Cylinder 1500?	8 long? 1.5 dla	1963 June 29,5 1963 July 23,8	88.6	90.5 88.8	4L299	196	396	0,015	147 36
	Hitch-biker 1	1963-25B	1963 June 27.03	Octagon 79.8 23 payload	0.3 long	1963 July 20,1 1963 Dec. 22,9	28.21	132,55	8607 8604	333	4132	0.220	350
	GRS	1963-26A	1963 June 28,83	cylinder 99.3	2.54 long 0.592 dia	1963 June 29.6 1963 Oct. 21.4	49.74	102,1	7239	411	1311	0.062	136
	[Thor Agena B] 1965=27A		1963 June 29,94 7 years	Cylinder 1500?	8 long?	1963 July 10.0 1964 Oct. 12.6	82.32	18°18	<b>6888</b> 6884	187 183	528	0,004	336 164
Q	Fragments	1563-278-C											
										-		-	The state of the s

Year of launch 1953, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Oribtal eccen- tricity	Argument of perigee (deg.)
Ω	[Atlas Agena D]	1963-28A	1963 Jul 12,86 5,2 days 1963 Jul 18,0	Cylinder 2000?	8 long? 1.5 dia	1963 Jul 17.1	95.37	88.2	6542	1971	164	0	136
Q	Fragments	1963-28B-C				,							
Ω	[Thor Agena D]	1963-29A	1963 Jul 19,00 25.8 days 1963 Aug 13,8	Cylinder 1500?	8 long? 1.5 dia	1963 Jul 20.7 1963 Jul 26.8 1963 Aug 11.6	82.86 82.86 82.86	90.44 90.37 88.65	6669 6656 6573	189 189 178	387 367 215	0.014	142 118 54
Ω	Fragment 1963-29B	89.											
	Midas 77	1963-30A	1963 Jul 19,16 100,000 years?	Cylinder 2000?	8 long? 1.5 dia	1963 Jul 23.5	88.41	168.0	10077	3670	3727	0.003	16
	TRS 1C	1963-30B	1963 Jul 19.16 50,000 years?	Tetrahedron 0.8	0.17 side	1963 Jul 20.5	88,36	168.0	10076	3662	3734	0,003	ı
	[Atlas Agena B] 1963-30D	1963-30D	1963 Jul 19,16 6 years	Inflated sphere 1.257	2.4 dia?	1963 Aug 6.1 1963 Dec 31.2	88 <b>.</b> 42 88 <b>.</b> 59	168.04 168.03	10083	3665	3745	0,004	45
	Fragments	1963-30C,E				1964 Nov 19.4	88.25	167.89	1007	3114		0.058	560
E-	Syncom 2	1963-31A	1963 Jul 26.61 > million yrs	cylinder 39	0.39 long 0.79 dia	1963 Jul 27.8 1964 Oct 9.6	33.05	1454.0	42512 42201	35584	36693	0.013	8 8
	Syncom 2 rocket	1963-31B	1963 Jul 26.61 15 years?	Cylinder 24	1.5 long 0.46 dia	1963 Aug 15.0 1963 Oct 15.5	33.14	636.5	24,505	15 FS	36029	0.730	
<u> </u>	[Thor Agena D] 1963-32A	1963-324	1963 Jul 31,000 12,0 days 1963 Aug 12,0	Cylinder 1500?	8 long? 1.5 dia	1963 Aug 5.7	74.95	4.06	999	157	411	0.019	110
Q	Fragment	1963-32B											

Year of Launch 1963, continued

Name   1166-158   1963-334   1965-454   1965-454   1965-554   1965-564   1965-574   1965-574   1965-574   1965-574   1965-575   1965-574   1965-574   1965-574   1965-575   1965-574   1965-575   19				Launch date,	on on one	0 to 0	Date of	Orbital	Noda1	Semi	Perigee	A pogee	Orbital	Argument
Cosmos 19   1963-334   1965 Aug 6.25   Ellipsold   1.8 long?   1965 Aug 15.6   49.01   97.71   6760   267   497   0.017		Маше		lifetime and descent date		(m)	orbital determination	tion (deg.)	period (min.)	axis (km)	height (km)	height (km)	eccen- tricity	perigee (deg.)
Thorage   1965-378   1965 Aug 6,25   Cylinder   10 long   1963 Aug 15,5   19,00   19,00   6796   2677   1469   0,010	Q	Cosmos 19	1963-33A	3 14	Ellipsoid 400?	1.8 long? 1.2 dla?	Aug 1 Oct 1 Jan	49°01 49°01 49°00	92.11 91.71 90.89	04/29	267 261 252	764 763 760	0.017 0.015	£2 88
Thor Agena D   1963-344   1965 Aug 25,02   Cylinder   8 long?   1965 Sep 7,3   75,01   89,4   6618   161   320   0,012     Fragment   1963-344   1965 Aug 25,80   Cylinder   8 long?   1965 Sep 2,7   81,89   90,80   6686   292   261   287   0,002     Thor Agena D   1963-354   1963-354   1963 Aug 25,80   Cylinder   8 long?   1965 Sep 10,8   91,37   89,06   6592   261   287   0,002     Thor Agena D   1963-354   1963-356-4   1963 Sep 23,-29   Cylinder   8 long?   1965 Sep 10,8   94,37   89,06   6594   168   1441   0,002     Thor Agena D   1963-368-4   1963-368-4   1963 Sep 13,-36   1963-368-4   1963	Q	Cosmos 19 rocket	1563-33B	1963 Aug 6,25 124,8 days 1963 Dec 9,0	Cylinder? 1500?		Aug 1 Oct 2 Dec	49°00 49°00 48°84	92.00 91.07 89.58	6756 6712 6626	267 253 235	489 415 261	0.016	109
Thor Agena D   1963-354   1963 Aug 29,80   Cylinder   8 long?   1963 Sep 3.0   81.89   90.80   6686   292   324   0.002   1963 Julia   1963-354   1963 Julia   1963-354   1963 Julia   1963-355   1963-356 Julia   1963-356 Julia   1963-356 Julia   1963-364 Julia		[Thor Agena D]	1563-34A	1963 Aug 25.02 18.6 days 1963 Sep 12.6	Cylinder 1500?		Sep	75.01	4°68	6618	161	320	0,012	104
[Thor Agena D] 1963-354 1963 Aug 29,80 Cylinder 8 long? 1963 Sep 2,0 6686 292 261 287 0,002 1 1963 Nov 7,5 1,5 1963 Nov 7,5 1963 Nov 7,5 1,5 1963 Nov 7,5 196	Q	Fragment	1963-34B											
[Thor Agena D] 1963-35B 1963 Aug 29.80 1963 Sep 2.7 81.89 92.07 6749 310 431 0.009  Pragments 1963-35C-D	Q	[Thor Agena D]	1963-35A	1963 Aug 29,80 69,7 days 1963 Nov 7,5	Cylinder		Sep	81.89	90°90	6686	26.28	324 287	0,002	151
Fragments 1963-35c-D	Q	[Thor Agena D]	1963-35B	1963 Aug 29.80 24-30 days 1963 Sep 23-29	1	ı	Sep	81.89	92,07	67/29	310	431	60000	261
Fragments 1963-368-F  [Thor Agena D] 1963-57A 1963 Sep 23.95 Cylinder 8 long? 1963 Sep 24.1 74.90 90.63 6679 161 441 0.0021 18.2 days 1500? 1.5 dia 1963 Oct 10.8 74.89 88.64 6594 150 282 0.010	QQ	Fragments [Atlas Agena D]	1963-35c-D	1963 Sep 6.81 7.05 days 1963 Sep 13.86	Cylinder 2000?	8 long? 1.5 dia	1963 Sep 10 <sub>e</sub> 8	94.37	90°58	6594	168	263	700°0	103
Thor Agena D 1963-37A 1963 Sep 23.95 Cylinder 8 long? 1963 Sep 24.1 74.90 90.63 6679 161 441 0.021 18.2 days 1500? 1.5 dia 1963 Oct 10.8 74.89 88.64 6594 150 282 0.010			963-36B-F							-				
		Thor Agena D		1963 Sep 23,95 18,2 days 1963 Oct 12,14	Cylinder 1500?	8 long?	Sep	74.90	79°63 88°64	4659 7659	150	441 282	0,021	101

Year of launch 1963, continued

								-					
	Мате		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
	Ablestar rocket	1963-38A	1963-38A 1963 Sep 28,84	Cylinder 450?	5.3 long 1.4 dia	1963 Sep 29.7	89,80	107.13	991/2	1069	1107	0,003	240
T?	Transit?	1963-38B	1963-38B 1963 Sep 28.84 1000 years?	22		1963 Oct 11.1	89.90	107,42	67.47	10.75	1127	0,003	232
€	Radiation satellite	1963-380	1963-38C 1963 Sep 28.84 1000 years?	- 79	ı	1963 Oct 11.2	89.89	107,40	6747	1075	1126	0,003	234
	Fragments 1	1963-380-€											
	[Atlas Agena D] 1963-39A 1963 Oct 17,010 (Vela 1?)	1963-39A	1963 Oct 17,10 >million yrs	Cylinder?	8 long?	1963 Oct 17.1	38.3	6270	113,000	102,098	111,137	0,040	ı
	TRS 2	1963-39B	1963-39B 1563 Oct 17.10	Tetrahedron 2.0	0.2 side	1963 Oct 17.1	36.77	2329	58,240	220	103,500	0.887	153
	Vela 2?	1963-390	1963-39C 1963 Oct 17,10 > million yrs	Icoseffedron 220	1.0 dia?	1963 Oct 19	37.8	02.29	113,900	95,300	115,800	0.072	ı
R?	Cosmos 20	1963-40A	1963-40A 1963 Oct 18,40 10 days 1963 Oct 28-29	•	ı	1963 Oct 18.7 1963 Oct 20.7	66.49	89 <b>.</b> 53	6632	205	302	700.0	32
Δ	Cosmos 20 rocket	1963-40B	1963-40B 1963 Oct 18,40 12 days 1963 Oct 30-31	Cylinder? 15007	10 long? 2 dia?	1963 Oct 18.4 1963 Oct 28.0	64.97	89.68	6635	20 <b>4</b> 185	310	0.008 0.004	3.6
J													

Year of launch 1963, continued

-	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of or orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	Apogre height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
	[Atlas Agena D]	1963-41A	1963 Oct 25.79 4.0 days 1963 Oct 29.8	Cylinder? 1500?	8 long?	1963 Oct 26.0 1963 Cct 27.8	99,05 99,05	88.70	6616 6584	45	332	0,014	97
-	Atlas Agena D] 1963-41B	1963-418	1963 Oct 25,79 3-4 days 1963 Oct 28-29	1	ı	1963 Oct 27.9	99°05	88,55	6575	136	297	0,012	82
	Fragments 19	1963-41C-D											
	[Thor Agena D]	1963-42A	1963 Oct 29,88 83,51 days 1964 Jan 21,39	Cylinder 1500?	8 long?	1963 Nov 2,1 1963 Nov 29,4 1964 Jan 6,4	89,90 89,89	90°84 90°42 89°53	6690 6670 6623	279 275 232	345 308 258	0,005 0,002 0,002	। ध्रु हो
	Thor Agena D]	1963-42B	1963 Oct 29,88 18 months	1	1	1963 Oct 31.7 1964 Nov 18.5	<b>89,99</b> 89,97	93.35 94.83	<b>6813</b> 6741	2 <b>85</b>	585	<b>0.022</b> 0.012	32 284
	Fragment	1963-42C											
	Polyot 1	1963-43A	1963 Nov 1 <sub>o</sub> 37	ı		1963 Nov 1.4 1963 Nov 2.0 1964 Nov 21.5	58.92	94.0 102.46	6843 7268 7248	339 343 347	592 1437 1392	0.018 0.075 0.072	- <del>1</del> 2 2 2 2
	Polyot 1 rocket	1963-43B	1963 Nov 1,37 3 years	Cylinder?	,	1963 Nov 5.6 1964 Nov 13.5	<b>58.58</b> 58.61	102.51 100.61	<b>7257</b> 7168	324 330	1434	920°0	116 192
	Fragments 19	1963-43C-D											
	Cosmos 21	1963-44A	1963 Nov 11.27 2.86 days 1963 Nov 14.13	ı		1963 Nov 11.4	64, 83	88,5	6577	182	216	0003	1
	Cosmos 21 rocket	1963-44B	1963 Now 11,27 1,69 days 1963 Now 12,96			Orbit similar to 1963-444	1963-44A						

	Маше		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
R	Cosmos 22	1963-45A	1963-45A 1963 Nov 16,45 6 days 1963 Nov 22	ŧ	1	1963 Nov 16,5	64,93	90.3	9999	192	381	0.014	1
Ω	Cosmos 22 rocket	1963-4:58	1963-4:58 1963 Nov 16.45 16.7 days 1963 Dec 3.2	Cylinder? 1500?	10 long? 2 dia?	1963 Nov 18,4 1963 Dec 1,1	64.86 64.84	90.14	6558	189	369	0.013	33
H	Explorer 18 (IMP 1)	1963-4:6A	1963-464 1963 Nov 27,010 2 years?	Octagon +4 vanes 62	0.34 lcng 0.74 dia.	1963 Nov 28.5 1964 Nov 9.4	33.34 36.39	<b>5666</b> 5600	1 <b>05,282</b>	192 3862	197 <b>,616</b> 192,358	0.938	152
	Explorer 18 rocket	1963-468	1963-468 1963 Nov 27,010 2 years?	Cylinder 24	1.8 long 0.46 dia.	Orbit similar tc Explorer 18	tc Explore	r 18					
	Centaur 2	1963-47A	1963-47A 1963 Nov 27,79 500 years	Cylinder 4620	8.6 long	1963 Nov 30.8	30,34	107,46	7500	544	1699	L0.0	137
	Fragments	1963-47В-н											
Ω	Thor Agena D	1963-48A	1963 Nov 27,88 17,3 days 1963 Dec 15,2	Cylinder 1500?	8 long?	1963 Nov 30	66*69	<b>30.</b> 2	8599	55 1	386	0,016	•

Year of launch 1963, continued

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	Мате		Launch date, lifetime and descent date	Shape and weight (kg)	S1ze (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
	Ablestar rocket	1963-49A	1963-49A 1963 Dec 5.91	Cylinder 450?	5.3 long 1.4 dia	1963 Dec 6.1	89,97	106.86	74.58	1065	1095	0,002	308
$\leftarrow$	[Thor Ablestar] 1963-498	1963-49B	1963 Dec 5,91 1000 years?	707	1	1963 Dec 12.4	86°68	107.18	897/2	1067	1112	0°003	327
€	Transit?	1963-490	1963 Dec 5,91 1000 years?	607	ı	1963 Dec 8.8	89,95	107,16	8947	1069	1111	600°0	303
	Fragments 19	1963-49D-F											
Q	Cosmos 23	1963-50A	1963 Dec 13,58 104,48 days	Ellipsoid 400?	1.8 lang?	1963 Dec 13.7 1964 Jan 9.3	49.0	92,90 92,27	6905	240	613 540	0,027	126 255
Q	Cosmos 23 rocket	1963-50B	1963 Dec 13.58 84.37 days	Cylinder? 1500?	10 long? 2 dia	1963 Dec 13.6 1964 Jan 12.0	49.12 48.99	92.84 92.04	6799	330	611 527	0,028	156 268
Q	Fragments 19	1963-50C-D	ו אמל וופו כוו ספא										
О	[Atlas Agena D] 1963-51A   1963 Dec 18,91   1,28 days   1,963 Dec 20,17	1963-51A	1963 Dec 18,91 1,28 days 1963 Dec 20,17	Cylinder 2000?	8 long?	1963 Dec 19.1	97.89	88, 48	6572	22	566	0.011	76
R?	Cosmos 24	1963-52A	1963 Dec 19,39 9 days 1963 Dec 28	ı	1	1963 Dec 19 <sub>e</sub> 8	65.03	90.51	9299	702	391	71000	617
Q	Cosmos 24 rocket	1963-528	1563 Dec 19,39 36.1 days 1964 Jan 24.5	Cylinder? 1500?	10 long? 2 dia?	1963 Dec 21.1 1964 Jan 13.0	65,00	90.58 89.61	6679	207	372	0,000	394
-4		-							1				

Continued on Page 44

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	Apogee he1ght (km)	Orbital eccen- tricity	Argument of perigee (deg.)
	Explorer 19	1963-53A	1963-53A 1963 Dec 19.78 4 years	Inflated sphere 7	3,65 dla	1963 Dec 19.8 1564 Oct 15.5	78.62 78.63	115,93	7870	590	23%	0,115	227
	Explorer 19 rocket	1963 <b>–5</b> 3F	1963-53F   1963 Dec 19,78   200 years	Cylinder 24	1.5 long 0.46 dia	1963 Dec 23.0	78,62	115,85	7867	594	2383	0-114	立
	Fragments 1963	1963-53B-E, G, H											
€	Tiros 8	1963-54A	1963-544   1963 Dec 21,39 60 years	Cylinder 119	0,55 long	1563 Dec 21.5	58.48	99,33	7105	69	765	0,005	123
	Tiros 8 rocket	1963-54B	1963-54B 1963 Dec 21,39 30 years	Cylinder 23	1.50 long 0.46 dia	1963 Dec 29,9	58,47	99,27	7103	969	753	0.004	117
	Fragments	1563-54c-D						-					
Q	[Thor Agena D] 1563-55A 1963 Dec 21,91 18,0 days 1964 Jan 8,9	1563 <del>-55</del> A	1963 Dec 21, 91 18,0 days 1964 Jan 8,9	Cylinder 1500?	8 long?	1963 Dec 22,3	# ·19	89,96	tr/99	176	355	0,0135	149
Ω	[Thor Agere D]		1963–55B 1563 Dec 21,93 326,89 days 1964 Nov 7,80	ı	ı	1963 Dec 23.8 1964 Jul 26.1 1964 Nov 4.1	64.52 64.52	91.68 90.73 88.72	6733 6689 6588	321 291 203	38 <b>8</b> 331 216	0.005 0.003 0.001	89 348 307

Year of launch 1964

Мате		Leunch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital irclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	A pogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
Agena D rocket	1964-01A	1964 Jan 11.84 800 years	Cylinder 1000?	6 long? 1.5 dia	1964 Jan 16,3	69.91	103.47	7298	305	456	0,002	78
<b>2</b> 899	1964-01B	1964 Jan 11.84 1000 years?	ı	ı	1964 Jan 16.8	76.69	103.47	7298	868	248	0.003	8
SECOR (EGRS)	1964-016	1964 Jan 11.84 1500 years	Rectangular box	0.4 x 0.3 x 0.2	19 <b>64</b> Jan 16,8	69.89	103.46	7297	706	933	0.002	ਲੋ
SR 5	1964-01D	1964 Jan 11.84 1000 years	Sphere 45	0.6 cie	1964 Jan 16.8	06.59	103.47	7298	305	934	0.002	rt.
[Thor Agena D] 1964-01E	1964-01E	1964 Jan 11.84 1000 years?	1	ı	1964 Jan 21.5	06.69	103.48	7298	905	426	0.002	96
[Thor Agena D] 1964-03A		300 years	<b>cylinder</b> 1500?	8 long? 1.5 dia	1964 Nov 9.5	70.66	101.33	7199	262	850	0,004	169
Fragments	1964-02B-C											
Relay 2	1964-03A	1964 Jan 21.88 million years	Octagonal prism 78	0.81 long 0.74 dia	1964 Jan 22,9	46.32	194.60	11129	2091	1411	0.239	184
Relay 2 rocket	1964-03E	1964 Jan 21.88 1 million years	Cylinder 23	1.5 long 0.46 dia	19 <b>64</b> Jan 22 <b>.</b> 8	46.32	194.61	11132	17.02	7437	0.241	186
											The state of the s	The second name of the second name of the second

Continued on page 46

Year of launch 1964, continued

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				-					
Argument of perigee (deg.)	104 19 330	103		135 105 317	19	R.R	23		
Orbital eccen- tricity	0.019 0.024 0.002	0.019		0.036 0.035 0.029	0.332	0.832	0.835		
Apogee height (km)	1316 1351 1178	1317		95 55 88 95 659	7126	67988	69123		
Perigee height (km)	1029 989 11 <b>48</b>	1030		797 797 797	394	806	£ 28		
Semi- major axis (km)	7551 7248 7241	7552		6890 6883 6830	10138	40593	41145		***************************************
Nodal period (min.)	108,95 108,88 108,66	108,96		94°60 94°41 93°49	169,32	1356.40	1384.00		
Orbital inclina- tion (deg.)	81.50 81.46 81.55	81.50		31.43	8°.09	60.87 59.25	60.87 59.34		and the second s
Date of orbital determination	1964 Jan 27.1 1964 Mar 4.9 1964 Nov 3.0	1964 Jan 27.1		1564 Jan 30.6 1964 Mar 3.1 1964 Nov 24.8	1964 Jan 31.5	1964 Feb 5.0 1964 Nov 21.2	1964 Feb 6.1 1964 Nov 24.3		
Size (m)	41 dia	6 long 1.5 dia		25.6 long 6.5 dia	3 long? 2 dla?	5 long? 2 dia?	10 long? 2 dia?	P. PORTOPOLITIES, Mar. Saine	maner some ethical control of the
Shape and weight (kg)	Sphere 256	Cylinder 1000?		Cylinder 17100	Cylinder and 6 paddles	Cone-cylinder and spire	Cylinder 15007		
Launch date, lifetime and descent date	1964 Jan 25,58 20 years?	1964 Jan 25.58 5000 years		19 <b>6</b> 4 Jan 29.68 20 months	1964 Jan 30.40 200 years	1964 Jan 30,40 10 years?	1964 Jan 30.40 10 years?		
Мате	1964-04A	1964-04B	1964-04c-€	1964-05A	1964-064	1964-06B	1964-06D	1964-060	
4	Echo 2	Echo 2 rocket	Fragments	Saturn SA5 1964-05A	Elektron 1	Elektron 2	Elektron 2 1964-06D rocket	Fragment	

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Space Vehicle: Ranger 6,1964-07

Year of launch 1964, continued

and a find the state of the sta	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Ortital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee, height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
.Thor Agena D] 1964—08A	A 1964 Feb 15.90 23.0 days 1964 Mar 9.9	Cylinder 1500?	8 long? 1.5 dia	1964 Feb 17.7 1964 Mar 5.5	74.95	90.86 89.5	6690	179	1777 1777	0.020	147
Fragment 1964-08B	8										
[Atlas Agena D]1964-09A	A 1964 Feb 25,79 4 days 1564 Mar 1	Cylinder 2000?	8 long? 1.5 dla	1964 Feb 26.4	95.66	88,24	9299	173	8	0.001	103
Fragment 1964-098	60										
Cosmos 25 1964-10A	1964 Feb 27.56 267.05 days 1964 Nov 21.61	Ellipsoid 400?	1.8 long?	1964 Feb 27.7 1964 Jun 10.5 1964 Nov 7.3	49.01 48.97 49.0	92.27 91.40 89.61	6769 6725 6636	253	526 441 301	0.020 0.014 0.005	121 248 236
Cosmos 25 1564-10B rocket	1964 Feb 27.56 111.7 days 1964 June 18.3	Cylinder? 1500?	10 long? 2 dia?	1964 Feb 28.4 1964 Jun 3.1	49.07 49.04	92.25 89.64	629	234	55.75	0.023	127
Fragments 1964-100-D	Q.				***						
[Thor Agena D] 1964-11A	7 years	Cylinder 1500?	8 long?	1964 Feb 29.1	82,03	7.4	8289	624	220	0.003	58
Fragments 1964-118-0	Ų.										

Continued on page 48

Year of launch 1964, continued

Neme	Iaunch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Ortital inclina- tion (deg.)	Nodel period (min.)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
[Atlas Agena D] 1964-12A	1964 Mar 11。84 4。3 days 1964 Mar 16。1	Cylinder 2000?	8 long? 1.5 dia	1964 Mar 12,9	55.73	88,2	6561	91	203	0.003	521
Fragment 1964-128											
Cosmos 26 1964–13A	1964 Mar 18.63 193.87 days 1964 Sept 28.50	Ellipsoid 400?	1.8 long? 1.2 dia?	1964 Mar 19.3 1964 Jun 20.4 1964 Sept 21.4	48.96 48.95 48.95	88. 8. 8. 8.	6705 6668 6598	266 250 207	387 330 233	0.009	122 212 304
Cosmos 26 1964-13B	1964 Mar 18,63 59,5 days 1964 May 17,1	Cylinder? 1500?	10 long? 2 dia?	1964 Mar 22.8 1964 Apr 30.4	48,99	89.82	6702	25.	291	0,008	132 331
Fragments 1964-13C-D					-						
Cosmos 27 1964-14A	1964 Mar 27.14 1.2 days 1964 Mar 28.3	ı		19 <b>64</b> Mar 27.6	64.80	88.16	6561	167	198	0,002	323
Cosmos 27 1964-14B rocket	1964 Mar 27.14 2.6 days 1964 Mar 29.7	ı	1	1964 Mar 28.5	64,80	88,22	9959	<u>£</u>	<u>4</u>	0.001	18
Fragments 1964-14C-D	*										
		-			1	1	1	1			

Year of Launch 1964, continued

		Мате	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodal period (min.)	Semi- major axis (km)	Perigee height (km)	Arogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
H	Ariel 2	1964-15A	1964 Mar 27.73 4 years	Cylinder + 4 paddles 68	0.9 long 0.58 dia	1964 Mar 28.4 1964 Jul 30.4 1964 Nov 18.0	51.65	101.29 101.00 100.68	7201 7188 2717	285 285 285	1362 133 <b>5</b> 1303	0.075 0.075 0.075	140 158 138
	Ariel 2 rocket	1964-158	1964 Mar 27.73 3 years	Cylinder 24	1.8 long 0.46 dla	1964 Mar 29.2 1964 Nov 15.5	51.67	101 .27	7200	282 282	1362	0.075	142
	Fragment	1964-150											
Q	Zond 1 Launcher	1964-16A	1964 Apr 2,12 1.5 days 1964 Apr 3,6	•	1	1964 Apr 2.5	64.83	74.88	6578	187	23	0.002	345
Q	Zond 1 rocket?	1964–168	1964 Apr 2,12 0,6 days 1964 Apr 2,7	ı	•	19 <b>64</b> Apr 2 <b>.5</b>	65.22	88.10	6229	8	offe	60000	139
Q	Fragment	1964-160											
D R?	Cosmos 28	1 964-1 7A	1964 Apr 4,40 7,9 days 1964 Apr 12,3	1	ı	1964 Apr 4.8	65.04	90,37	1299	엄3	373	0,012	517
Q	Cosmos 28 rocket	1964-178	1964 Apr 4,40 28,7 days 1964 May 3,1	cylinder? 1500?	10 long? 2 dia?	1964 Apr 4.9	65.01	90°48	9299	<del>ग</del> ंदर	371	0,011	63
Q	Fragment	1964-170							-				

Year of Launch 1964, continued

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Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	tion tion (deg.)	Nodal period (min.)	major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	of perigee (deg.)
Cone -	Cone-cylinder 5170 payload 3000	11.6 long 3.0 dia	1964 Apr 9.5	32 <b>,56</b>	89,00	9999	立	299	0.011	8
	1	ī	1964 Apr 14.1 1964 May 10.8 1964 Nov 10.2	59.92 58.06 58.07	92.31 92.05	6742 6769 6755	242 30 <b>3</b> 289	485 479 465	0.018	758 75
,		1	1964 Apr 17.2	59,92	₹. ₽	6729	236	797	0.017	63
Cylinder 2000?	der	8 long? 1.5 dia	1964 Apr 25.5	103.56	04.68	99 99 99	35	336	0.014	128
1			1964 Apr 28,2	65•01	89.50	9299	203	536	2000	8
Cylinder? 1500?	er?	10 long? 2 dia?	1964 Apr 28.3	65.04	89.56	6631	820	586	0.005	69
							•			
	1									

D R?

Year of Launch 1964, continued

D R?

Q

Argument of perigee (deg)	130	38	র	8	122	66	ı		107 44
Orbital eccen- tricity	0.020	0.012	0.010	0.018	0,002	700°0	700°0		0.021
Apogee height (km)	91/1	366	338	380	†0Z	926	926		153 153
Perigee height (km)	178	306	205	141	179	<b>1</b>	<b>1</b> 58		149
Semi- major axis (km)	0699	1999	0599	6639	6570	7283	7283		6667 6610
Nodal period (min.)	77.06	90.25	46.68	89.69	88,22	103.12	103.13		90.27
Orbital inclina- tion (deg.)	79.93	64.87	48,479	101.12	31.74	24.06	30°45		79.95
Date of orbital determination	1964 May 1.1	1964 May 20.3	1964 May 24,2	1964 May 20.7	19 <b>64</b> May 29•7	1964 June 5.2	1964 June 19.2		1964 June 7.1 1964 June 17.0
Slze (m)	8 long? 1.5 dla	ı	10 long? 2 dia?	8 long? 1.5 dla	24 long 5.7 dia	1	1.5 long 0.46 dia		8 long?
Shape and weight (kg)	Cylinder 1500?	ī	cylinder? 1500?	Cylinder 2000?	Cone-cylinder 16900	- 609	Cylinder 24		Cylinder 15007
Launch date, lifetime and descent date	1964 Apr 27,98 28,19 days 1964 May 26,17	1964 May 18,41 7,90 days 1964 May 26,31	1964 May 18,41 20,3 days 1964 June 7,7	1964 May 19,81 2,9 days 1964 May 22,7	1964 May 28,71 3,31 days 1964 June 1,02	1964 June 4,16 200 years	1964 June 4,16 200 years		1964 June 4,96 13,94 days 1964 June 18,90
9	] 1964-22A	1964-23A	1964-23B	D] 1964-24A	19 <b>64-25</b> A	1964-26A	1964-26D	1964-26B-C	] 1964-27A
Лате	[Thor Agena D] 1964-22A	Cosmos 30	Cosmos 30 rocket	[Atlas Agene D] 1964∞24A	Saturn SA6	Transit? [Blue Scout]	Altair rocket 1964-26D	Fragments	[Thor Agena D] 1964-27A

e e										
Argument of perigee (deg.)	353	118	35	8		24 329 329		334	147	
Orbital eccen- tricity	0.020	0.020	0,008	900°0		0.001		0,001	0.001	
Apogee height (km)	492 301	301	319	312		357		842	21/8	
Perigee height (km)	222 1.95	808	23.3	232		改造な		828	828	
Semi- major axis (km)	673 <b>5</b> 6626	6733	11799	0599		6735 6728 6719		7213	7213	
Nodel period (min.)	91.61 89.40	91.60	89,76	89.93		8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		101 . G4	101.64	
Orbital inclina- tion (deg.)	48,93 48,97	48.97 48.94	51.24	51.30		114,98 114,98 115,00		48°66	99.83	
Date of orbital determination	1964 June 6.7 1964 Oct 8.5	1964 June 8.2 1964 Aug 8.3	1964 June 10.9	1964 June 12,4		1964 June 14.6 1964 Sept 11.3 1964 Nov 2.5		1964 June 18,4	1964 June 24.2	
Size	1.8 long?	10 long? 2 dla?	1	10 long? 2 dia?		8 long? 1.5 dia		8 long?	1	
Shape and weight (kg)	Ellipsoid? 4007	Cylinder? 1500?		Cylinder? 15007		Cylinder 2500?		Cylinder		
Launch date, lifetime and descent date	1964 June 6.25 135.97 days 1964 Oct 20.22	1964 June 6,25 71,35 days 1964 Aug 16,60	1964 June 10.45 8.0 days 1964 June 18.5	1964 June 10,45 34,43 days 1964 Jul 14,88		1964 June 13,66 1 year		1964 June 18,20 400 years	1964 June 18,20 500 years?	
	1964-28A	1964-288	1964-294	1964-298	1964-29C	1964 <del>-</del> 30A	1964-30B	] 1964-31A	1964-31B	1964-31C
Маше	Cosmos 31	Cosmos 31 rocket	Cosmos 32	Cosmos 32 rocket	Fragment	Starflash 1A [Agena D]	Fragment	[Thor Agena D] 1964-31A	Capsule	Fragment

D R?

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Year of launch 1964, continued

Name	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg.)	Nodel period (min.)	Semi- major axis (km)	Perigee height (km)	A pogee height (km)	Orbital eccen- tricity	Argument of perigee (deg.)
[Thor Agena D] 1964-32A	1964 June 19,97 26,81 days 1964 July 16,78	<b>Cylinder</b> 1500?	8 long? 1.5 dia	1964 June 21.1 1964 Jul 10.5	85.0 84.99	90.98 89.60	6697	571 571	462	0.021	. 95
Fragment 1964-32B											
Cosmos 33 1964-33A	1964 June 23,43 7,99 days 1964 July 1,36	ı	ı	1964 June 23.6	65.0	89,50	6299	203	293	900°0	1
Cosmos 33 1964-33B rocket	1964 June 23,43 17,37 days 1964 July 10,80	Cylinder? 1500?	10 long? 2 dia?	1964 June 23.8	65.08	89.54	0630	29	285	0.005	24
Fragments 1964-330-D											
Cosmos 34 1964-34A	1964 July 1.47 7.93 days 1964 July 9.40	1	ī.	1964 July 3.4	64°86	86°68	6653	202	348	0.011	37
Cosmos 34 1964–34B	1964 July 1947 13,89 days 1964 July 15,36	Cylinder? 1500?	10 long? 2 dia?	1964 July 5.4	64°89	89.80	<del>1</del> 1199	133	339	0,011	র্ম

D R?

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Q

D R?

Continued on page 54

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4	T								
Argument of perigee (deg.)	1 28	145	Ø3		133	20	R	۶	
Orbital eccen- tricity	0.002	0.017	90000		0.021	0.328	828.0	0.830	
A pogee height (km)	523	346	374		1947	7025	192999	05529	
Perigee height (km)	56.3	Ē	297		180	101	151	E.4	
Semi- major axis (km)	6892	6612	6715 6666		6699	10093	39757	40289	
Nodal period (min.)	त ४ इ. इ.	89,20	99.2		8, 6	168,17	1313.63	1341.37	
Orbital inclina- tion (deg.)	82,09 82,08	92,89	%.9 %.9		86.48	60.79	8.09	<b>%</b> 09	
Date of orbital determination	1964 Jul 5,5 1964 Nov 25,3	1964 Jul 7.4	1964 Jul 8,5 1964 Nov 26,2		1964 Jul 13.4	1964 Jul 14.3	1964 Jul 14.5	1964 Jul 15.9	
81ze (m)	8 long?	8 long? 1.5 dla	1		8 long? 1.5 die	3 long? 2 dia?	5 long? 2 dia?	10 long? 2 dia?	
Shape and weight (kg)	<b>Cylin</b> der 15007	cylinder 20007	•		Cylinder 1500?	Cylinder and 6 paddles	Cone-cylinder 5507	Cylinder? 1500?	
Launch date, lifetime and descent date	1964 Jul 3.06 7 years	1964 Jul 6,91 2,0 days 1964 Jul 8,9	1964 Jul 6,91 180,21 days (1965 Jan 3,12)		1964 Jul 10,97 26,52 days 1964 Aug 6,49	1964 Jul 10.91 200 years?	1964 Jul 10,91 10 years?	1964 Jul 10.91 10 years?	
	1564-35A	1964-36A	1964-368	1964-36c	1964-378	1964-38A	1964-588	1964-380	1964-38c
Меше	[Thor Agene D] 1564-35A	[Atlas Agena D] 1964-36A	Ca psule	Fragment	[Thor Agena D] 1964-378	Elektron 3	Elektron 4	Elektron 4 rocket	Fragment

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Year of launch 1964, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- mejor axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
D R7	Cosmos 35	1964-398	1964 Jul 15.48 7.92 days 1964 Jul 23.40	1.	1	1964 Jul 16.2	51.24	89.2	96616	N 8	258	0.003	8
Q	Cosmos 35 rocket	1964-398	1964 Jul 15,48 17,32 days 1964 Aug 1,80	Cylinder? 1500?	10 long? 2 dia?	1964 Jul 16,3	51.32	89.40	6627	216	282	0,005	130
	Fragments	1964-39C-D											
	[Atlas Agena] 1964-40A (Vela 3?)	1 964-40A	1964 Jul 17.35 >million years	Cylinder?	9 long?	1964 Jul 17 <sub>6</sub> 4 1964 Dec 15 <sub>6</sub> 5	39 <b>.58</b> 39 <b>.</b> 13	6022.6 6091.5	109653 110487	101959 103048	104591 105169	0.012	149
	Vela 4?	1964-40B	1964 Jul 17.35 > million years	Icosahedron 234	1.0 dia	1964 Jul 17.4 1964 Dec 15.5	40.88	6007.0	10 <b>9</b> 462 110233	94436 94584	11175	0.079	<b>#</b> .
<b>6</b>	TRS	1964-400	1964 Jul 17,35	Tetrahedron 2.0	0.2 side	1964 Jul 17.4 1964 Oct 24.9	36.7	2364	58988 58555	220 820	105000	0,888	147
	Cosmos 36	1964-42A	1964 Jul 30.15 7 months	Ellipsoid 400?	1.8 long?	1964 Aug 2,4 1964 Dec 8,9	49.00	98.85	8699 247	2 <b>61</b> 239	774	0,016	127
Q	Cosmos 36 rocket	1964-428	1964 Jul 30,15 121,98 days 1964 Nov 29,13	Cylinder? 1500?	10 long? 2 dia?	1964 Aug 4.7 1964 Oct 7.4 1964 Nov 24.0	49.02 49.00 48.99	9.83 9.12 89.22	9t/29 01/29 71/99	45.45 25.92	482 419 265	0.017	14.3
											-		-

Space vehicle: Ranger 7, 1964-41

Continued on page 56

Year of launch 1964, continued

Thor Agena   1964-445   1964-445   1964 Aug 14-22   Cosmos 37   1964-445   1964 Aug 14-22   2 das   1964 Aug 18-2   2 das   1964 Aug 18-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-22   2 das   1964 Aug 18-2   2 das   1964 Aug 14-22   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 14-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das   1964 Aug 18-2   2 das   1964 Aug 14-2   2 das   1964 Aug 18-2   2 das		The state of the s	The state of the s	Company of the Compan	The state of the s	The same of the sa								
[Thor Agena] 1964-434 1964 aug 5.97		Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	-	Semi- mejor axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Cosmos 37 1964-444 1964 Aug 14,400 1964 Aug 15,8 64,92 89,41 6625 207 287 287 1964 Aug 14,40	Q	[Thor Agena]	1964-43A	1964 Aug 5,97 26.0 days 1964 Sept 1,0	Cylinder 1500?	8 long? 1.5 dia	1964 Aug 6.9 1964 Aug 24.8		90.71 89.35	6199	182 175	126	0.019	138
Cosmos 37 1964-44B 1964 Aug 14.40 Cylinder? 10 long? 1964 Aug 15.8 65.01 89.54 6633 215 295  rocket 19.64 days 14.40 19.64 days 14.50 2 dda? 19.64 Aug 14.92 Cylinder 8 long? 1964 Aug 17.6 95.52 89.0 6606 149 307  Capsule 1964-45B 1964 Aug 14.92 - 1964 Aug 18.3 95.67 127.40 8590 275 3748  Fragment 1964-45C 878 277 378	D R7	Cosmos 37	1964-444A	1964 Aug 14,40 8 days? 1964 Aug 227	1	1	1964 Aug 15.8	64.92	89.41	6625	202	287	900°0	8
[Atlas Agena] 1964-454 1964 Aug 14.92 cylinder 8 long? 1964 Aug 17.66 95.52 89.0 6606 149 307  Capsule 1964-45B 1964 Aug 14.92 - 1964 Aug 18.3 95.67 127-40 8390 275 3748  Fragment 1964-45C	Q	Cosmos 37 rocket	1964-44B	1964 Aug 14.40 19.64 days 1964 Sept 3.04	Cylinder? 1500?	10 long? 2 dla?	1964 Aug 15.8	65.01	₽ <b>.</b> 54	6633	215	88	900°0	36
Capsule 1964-4158 1964 Aug 14.92 - 1964 Aug 18.3 95.67 127-40 8390 275 3748 (Hitch-hiker?) 30 years 1964 Dec 10.0 95.68 127.24 8578 274 3726 Fragment 1964-45C		[Atlas Agena]	1964-45A	1964 Aug 14,92 8,8 days 1964 Aug 23,7	Cylinder 20007	8 long?	1964 Aug 17.6	85. 84	89.0	9099	149	307	0.012	135
Fragment 1964-45c		Capsule (Hitch-hiker)	1964-4.58	19 <b>64</b> Aug 14.92 30 years	•	ı	1964 Aug 18,3 1964 Dec 10,0	95.67 95.68	127.40	85.58 85.78	51.Z	3748	0.207	11
		Fragment	1964-450											

Year of launch 1964, continued

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Мате		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Cosmos 38	1964-46A	1964 Aug 18,39 82,4 days 1964 Nov 8,8	ı	1	1964 Aug 18.8 1964 Oct 3.5 1964 Nov 1.4	56.12 56.13 56.09	94.31 92.17 89.70	6866 6760 641	8 2 2	769 173 336	0.041 0.028 0.011	60 157 233
Cosmos 39	1964-468	1964 Aug 18,39 91,14 days 1964 Nov 17,53	t	1	1964 Aug 18.8 1964 Oct 12.4 1964 Nov 11.4	56.10 56.10 56.10	94.59 89.52	6880 6751 <b>66</b> 31	206 197 186	738 842 319	0.043 0.026 0.010	25 17 14
Cosmos 40	1964-460	1964 Aug 18,39 92,50 days 1964 Nov 18,89	ſ	1	1964 Aug 19.7 1964 Oct 5.6 1964 Nov 9.5	56.12 56.10 56.10	95.95 92.07 89.74	6851 6757 6643	8 2 2	740 561 345	0.039 0.027 0.012	61 162 247
Cosmos 38	1964-460	1964 Aug 18,39 6 months	1	ı	1964 Aug 19.8 1964 Dec 11.5	<b>56.</b> 12 <b>56.</b> 15	95.13 92.51	8069	212	848 590	0.046	ಕೆ ಕ್ಲ
Fragments	1964-46E-G											
Syncom 3	1964-47A	1964 Aug 19,51 >million years	Cylinder about 30	0.39 long 0.71 dia	1964 Aug 22,2 1964 Dec 15,5	0.10	1407.8 1436.5	41609	34191	36271	0,025	117
Syncom 3 rocket	1964-478	1964 Aug 19,51 100 000 years	Cylinder 24	1.5 long 0.46 dla	1964 Aug 20,2	16.70	698.83	25914	1137	37935	0.70	181
Starflash 1B [Agena]	1564-48A	1964 Aug 21.66 6 months	Cylinder 15007	8 long? 1.5 dla	1964 Aug 25.6 1964 Dec 5.5	115.0	90°80	4529 4629	305	363	0,000	108

Year of launch 1964, continued

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Name	82	Launch date, lifetime and descent date	Shape and weight (kg)	S1296 (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodel period (min)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Cosmos 41	1964-490	1964 Aug 22,30 100 years?	•	1	1964 Sept 10.7	88 -179	714.58	77,485	9247	39771	0.743	326
Cosmos 41 rocket	1964-49A	1964 Aug 22,30 24,24 days 1964 Sept 15,54	Cylinder? 1500?	10 long? 2 dia?	1964 Aug 23.7	47.49	90°16	9029	200	455	0.019	%
Fragments	1964-498,0.更								2			
Cosmos 42	19 <b>64-50A</b>	1964 Aug 22.46 18 months	1.	1	1964 Aug 23.2 1964 Dec 8.9	48.96 48.96	98.95 96.85	7407	230	995	0,062	5 2 2
Cosmos 42 rocket	1964-508	1964 Aug 22,46 1 year	Cylinder? 1500?	10 long? 2 dia?	1964 Aug 23e4 1964 Dec 12e2	48.97 48.97	97.91 96.14	7040	<b>A</b>	1098	0.062	112
Cosmos 43	1984-500	1964 Aug 22.46 16 months	ı	,	1964 Aug 23.3 1964 Dec 6.3	48.96	96.82	7042	ZZ ZZ	1100 140	0,062	111
Explorer 20	1964-51A	1964 Aug 25.57 800 years	Double cone	0.83 long 0.66 dia	1964 Aug 25.9	77.67	104.09	7329	878	100	0,000	304
Explorer 20 1964-518 rocket	1964-518	1964 Aug 25,57 500 years	Cylinder 24	1.5 long 0.46 dia	1964 Aug 26.6	79.93	103.92	7321	877	1009	0000	300
Fragments	1964-510-₤											

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Year of launch 1964, continued

					Control of the Contro								
	Лаше		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
H	Nimbus 1	1964-52A	1964 Aug 28.39 20 years	Conical skeleton + 2 paddles 576	2,85 long	1964 Aug 28.8	98.66	2H-86	1902	624	987	0°036	158
	Nimbus 1 rocket	1964-528	1964 Aug 28.39 10 years	Cylinder 10007	6 long 1.5 dia	1964 Sept 15.5	98° 68	04°86	2060	624	488	920°0	ě
H	Cosmos 44	1964-53A	1964 Aug 28.68 100 years?	i	1	1964 Aug 29.3	65.04	84°66	7114	615	857	0°0 7	83
	Cosmos 44	1964-538	1964 Aug 28.68 50 years	Cylinder? 1500?	10 long? 2 dia?	1964 Aug 30.1	65.05	₹.66	7117	682	%	900°0	517
€	1 000 1	1964-54A	1964 Sept 5,92 2 years?	Box + booms 487	1.82 long 0.91 wide 0.91 high	1964 Sept 7.8 1964 Nov 13.4	31.15	3838.8	81251 81251	28t	155763	0.918	313
	OGO 1 rocket	1964-548	1964 Sept 5.92 2 years?	Cylinder 10007	6 long	``		Orbi	t similar	Orbit similar to 1964-54A	A4Z		
D 83	Cosmos 45	1964-554	1964 Sept 13.41 4.9 days 1964 Sept 18.3	4	1	1964 Sept 14.6	64.89	89.68	8698	207	313	800°0	36
Q	Cosmos 45 rocket	1964-538	1964 Sept 13.41 14.45 days 1964 Sept 27.86	Cylinder? 1500?	10 long? 2 dia?	1964 Sept 14.5	64.88	89.60	<b>†</b> £99	203	309	0,008	36
Q	[Thor Agena]	1964-56A	1964 Sept 14.95 21.7 days 1964 Oct 6.7	Cylinder 15007	8 long?	1964 Sept 16.1	84.96	90°88	1699	23.8	9917	0.022	135
Q	Fragment	1964-568											

Year of launch 1964, continued

Argument of perigee (deg)	142	173		16	125	133		158
Orbital eccen- tricity	0,002	0°012		†00°0	0,002	0.879		0.019
A pogee he ight (km)	203	303		264	259	95595	⊼ _	0440
Perigee height (km)	178	145		2	234	362	Orbit similar to Explorer 21	8
Semi- major axis (km)	8959	999		9199	†Z99	53971	similar t	6899
Nodal period (min)	88°30	89.00		89.22	oh*68	20 <i>97</i> 20 <b>8</b> 0	Orbit a	90.75
Orbital inclina- tion (deg)	31.72	82.9		51.25	51.27	33.53 33.77		79•97
Date of orbital determination	1964 Sept 20.3	1964 Sept 25.2		1964 Sept 25.5	1964 Sept 25.5	1964 Oct 4.2 1964 Dec 15.5		1964 Oct 7.3
Size (m)	24.4 long 5.5 dia	8 long?		ı	10 long? 2 dla?	0.20 long	1.5 long 0.46 dia	8 long? 1.5 dla
Shape and weight (kg)	Cylinder 16700	Cylinder 2000?		t	Cylinder? 1500?	Octagon + 4 vanes 62	Cylinder 24	Cylinder 1500?
Launch date, lifetime and descent date	1964 Sept 18.68 3.86 days 1964 Sept 22.54	1964 Sept 23.84 4.78 days 1964 Sept 28.62		1964 Sept 24.50 8.02 days 1964 Oct 2.52	1964 Sept 24,50 13,22 days 1964 Oct 7,72	1964 Oct 4.16 10 years?	1964 Oct 4.16 10 years?	1964 Oct 5.91 20.50 CBYS 1964 Oct 26.41
	1964-57A	1964-584	1964-58B	1964-59A	1964-598	1964-60A	1964-60B	19 <b>64-6</b> 1A
Name	Saturn SA7	[Atlas Agena] 1964-58A	Fragment	Cosmos 46	Cosmos 46 rocket	Explorer 21 (Inp 2)	Explorer 21 rocket	[Thor Agena]

Year of launch 1964, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
D R?	Cosmos 47	1964-62A	1964 Oct 6.30 1.0 days 1964 Oct 7.3	1	1	1964 Oct 6.7	29°†79	20.07	2999	174	383	910-0	2
Ω	Cosmos 47 rocket	1964-628	1964 Oct 6.30 7.9 days 1964 Oct 14.2	Cylinder? 1500?	10 long? 2 dla?	1964 Oct 7.2	17.40	89.92	61799	168	373	0.015	29
Q	Fragments	1964-62C-E									127		
	Ablestar rocket	19 <b>64-6</b> 3A	1964 Oct 6.70 1500 years	Cylinder 450?	5.3 long 1.4 dia	1964 Oct 12,1	89.91	106.65	8447	1055	1085	0.002	35
17	[Thor Ablestar] 1964-63B	1964-67B	1964 Oct 6,70	1	ī	1964 Dec 21.2	89.92	106.65	8447	1055	1085	0,002	156
H	[Thor Ablestar] 1964-630	1964-630	1964 Oct 6.70	1	1	1964 Oct 13.0	89.93	106.63	7447	1054	1084	0,002	8
⊬	[Thor Ablestar] 1964-63E	1964-63E	1964 Oct 6.70 1000 years	ı	1	1964 Oct 14.5	89.97	106,66	6447	1056	1086	0,002	32
	Fragments	1964-63D,F											
€	Explorer 22 (Beacon)	1964-64A	1964 oct 10.13 2000 years	Octagon 52	0.30 long 0.46 dia	1964 Oct 10.1	79.69	104.70	6552	885	1077	0.013	146
	Explorer 22 rocket	1964-648	1964 Oct 10.13 300 years	Cylinder 24	1.5 long 0.46 dia	1964 Oct 20.9	79.69	104.75	7362	888	1079	0.013	119

Continued on page 62

Year of launch 1964, continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Voskhod 1	1964-65A	1964 Oct 12,31 1,01 days 1964 Oct 13,32	1	1	1964 Oct 12.7	06 <del>11</del> 90	90.04	6655	177	377	0,015	8
Voskhod 1 rocket	1964-638	1964 Oct 12,31 8,1 days 1964 Oct 20,4	Cylinder?	1	1964 Oct 15.7	C4.77	89,39	6627	169	328	<b>0</b> •012	57
Fragment	1964-650		,									
Cosmos 48	1964-66A	1964 Oct 14.41 5.96 days 1964 Oct 20.37	•		1964 Oct 15.8	65.08	89,32	889	204	<b>28</b>	900°0	۲۵
Cosmos 48 rocket	1964-668	1964 Oct 14.41 13.84 days 1964 Oct 28.25	Cylinder? 1500?	10 long? 2 dia?	1964 Oct 15.5	65.06	89.53	6829	24	8	900°0	Ø
Fragment	1 964-66c											
[Thor Agena]	1964-67A	1964 Oct 17.91 17.28 days 1964 Nov 4.19	Cylinder 1500?	8 long? 1.5 dla	1964 Oct 19.1	74.99	90.59	1899	189	416	0 <b>.</b> 07	147
[Atlas Agena] 1964-68A	19 <b>6</b> 4-68 <b>A</b>	1964 Oct 23.76 5.07 days 1964 Oct 28.83	Cylinder 2000?	8 long? 1.5 dla	1964 Oct 24.6	95.55	988.6	6583	139	27	0,000	169
Capsule	1964-68B	1964 Oct 23.76 4 months	1	1	1964 Oct 27.9	95.84	91.14	6708	323	336	0,001	330
Fragments	1964-68C-D			V								

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Year of launch 1964, continued

Name	0	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodel period (min)	Semi- mejor axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
Cosmos 49	1964-69A	1964 Oct 24,22 14 months	Ellipsoid 4007	1.8 long? 1.2 dia?	1964 Oct 24.7 1964 Dec 16.4	48.99 48.94	97.78	6743 6754	264	75µ 766	0.015	117
Cosmos 49 rocket	1964-698	1964 Oct 24.22 109.46 days (1965 Feb.10.68)	Cylinder? 15007	10 long? 2 dia?	1964 Oct 24.7 1964 Dec 3.4	48°84 48°93	9.8	9th29	260	7 <u>7</u> 4 1750	0,016	117 30 <b>6</b>
Fragment	1964-690											
Cosmos 50	1964-70A	1964 Oct 28,45 8,0 days 1964 Nov 5,5	ı	ı	1964 Oct 29.7	¥.	88.67	6588	8	230	0.003	312
Cosmos 50 rocket	1964-708	1964 Oct 28,45 4,7 days 1964 Nov 2,2	Cylinder? 15007	10 long? 2 dia?	1964 Oct 29.7	म्द्र•।ऽ	88,86	6592	187	Sho	0°00f	82
Fragments	1964-700-1											
[Thor Agena]	1964-71A	1964 Nov 2,89 25,34 days 1964 Nov 28,23	Cylinder 15007	8 long? 1.5 dia	1964 Nov 3.6	73.95	90.70	899	180	8111	0,020	155
[Thor Agena]	1964-72A	1964 Nov 4.09 7 years	Cylinder 1500?	8 long?	1964 Nov 5e1	82,00	95.05	6897	512	526	0,001	303
Fragments	1964-728-0											

Continued on page 64

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Year of launch 1964, continued

Argument of perigee (deg)	138	90	35	991	ı		313	317	1
Orbital eccen- tricity	0.036	0°012	0.125	0,125	0.124		9000	0.001	0.015
Apogee height (km)	776	339	2498	रुफ्ट	24.95		249	8	35.1
Perigee he ight (km)	99†7	180	525	22	23		153	177	158
Semi- Major axis (km)	7100	8638	7889	9882	7891		1959	6562	9636
Nodal period (min)	99.17	N. 28	116,30	116.27	116,2		88,16	88.15	89.69
Orbital inclina- tion (deg)	51.95	70.02	81.36	81.36	81.36		2.49	64.73	97.02
Date of orbital determination	1964 Nov 6.51	1964 Nov 21.70	1964 Nov 21.79	1964 Nov 21.79	1964 Dec 15 <sub>e</sub> 5		1964 Nov 30.9	1964 Dec 1.5	1964 Dec 5,2
Size (m)	2.3 long 0.62 dia	8 long?	3.65 dia	0.61 dia	1.5 long 0.46 dia		1	1	8 long? 1.5 dia
Shape and Weight (kg)	Cylinder 134	Cylinder 1500?	Inflated sphere 8.6	Sphere 40	Cylinder 23		ı	ı	Cylinder 20007
Launch date, lifetime and descent date	1964 Nov 6.50 50 years	1964 Nov 18,90 17,41 days 1964 Dec 6,31	1964 Nov 21.71 5 years?	1964 Nov 21.71 200 years	1964 Nov 21.71 100 years		1964 Nov 30,55 1,23 days 1964 Dec 1,78	1964 Nov 30,55 2,10 days 1964 Dec 2,65	1964 Dec 4,•79 1,•2 days 1964 Dec 6,0
40	1964-74A	1964-75A	1964-76A	1964-76B	1964-76c	1964-760-7	1964-78A	1964-78B	
Меше	Explorer 23	[Thor Agena]	Explorer 24	Explorer 25 (Injun 4)	Explorer 24 rocket	Fragments	Zond 2 launcher	Zond 2 rocket	[Atlas Agena] 1964-79A

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Space Vehicles: Mariner 3, 1964-73; Mariner 4, 1964-77; Zond 2,1964-78C.

Year of launch 1964, continued

	Маше	ω	Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- major axis (km)	Perigee height (km)	Apogee he ight (km)	Orbital eccen- tricity	Argument of perigee (deg)
E	Cosmos 51	1 964-80A	1964 Dec 9,96 1 year	Ellipsoid 4007	1.8 long?	1964 Dec 11.9	48.78	92,44	9229	362	533	0°050	130
	Cosmos 51 rocket	1964-80B	1964 Dec 9,96 5 months	Cylinder? 15007	10 long? 2 dia?	1964 Dec 11.9	48.78	95°46	8779	257	545	0,021	129
	Fragments	1 964-80c-F											
Ω	[Titan 3A]	1964-81A	1964 Dec 10.70 2.95 days 1964 Dec 13.65	Cylinder 1500	5 long? 3 dia	1964 Dec 12,3	32,15	87.60	6542	157	6. E	0,001	580
Q	Centaur 4	1964-82A	1964 Dec 11.60 0.65 days 1964 Dec 12.23	Cylinder 2950	14 long 3 dia	1964 Dec 11.7	30.71	87.81	6550	165	178	0,001	183
	Ablestar	1964-83A	1964 Dec 13,00 1000 years	Cylinder 4507	5.3 long 1.4 dia	1964 Dec 16.1	89.99	106.06	7420	1012	1071	†00°0	352
13	[Thor Ablestar]	19 <b>64-8</b> 38	1964 Dec 13.00 1000 years?		ı	1964 Dec 15.5	89,97	106.26	7430	1031	1074	0°003	ı
E4	Radiation satellite	1964-83c	1964 Dec 13.00 1000 years?	- 603	1	1964 Dec 24.5	88,99	106,36	7435	1027	1086	70000	286
T?	Transit?	1964-83D	1964 Dec 13.00 1000 years?	- 609	ı	1964 Dec 24,8	98°86	106.33	7433	1025	1084	*700°0	13
	Fragments	1964-83E-F											

Year of launch 1964, continued

Мате		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclina- tion (deg)	Nodal period (min)	Semi- major axis	Perigee height (km)	Apceee height (km)	Orbital eccen- tricity	Argument of perigee (deg)
San Marco 1 19	1964-84A	1964 Dec 15.85 8 months	Sphere 115	0.66 dia	1964 Dec 16.9	37.77	75.45	0069	198	846	240.0	113
San Marco 196 rocket	1964-84B	1964 Dec 15.85 53.2 days (1965 Feb 7.1)	Cylinder 24	1.5 long 0.46 dia	1964 Dec 31.5	37.80	33.5	†Z89	4	697	750.0	ı
Fragment 19	1964-84c											
[Thor Agena] 19	1964-85A	1564 Dec 19.88 26.06 days (1965 Jan 14.94)	Cylinder 15007	8 long? 1.5 dia	1964 Dec 22.9	74.97	9ħ°06	6675	183	014	2.000	3
Explorer 26 199	1964-864	1964 Dec 21.38 10 years?	Octagon + 4 vanes 46	0.43 long 0.77 dla	1964 Dec 21₀4	20.14	456.26	19632	316	26191	0.659	<u>£</u>
Explorer 26 196 rocket	1964-86B	1964 Dec 21.78 10 years?	Cylinder 23	1.5 long 0.46 dia		_	orbit similar to 1964-86A	illar to	1964-86A			
[Thor Agena] 19	1 <i>9</i> 64-87A	1964 Dec 21.80 21.64 days (1965 Jan 11.44)	cylinder 15007	8 long? 1.5 dia	1964 Dec 25.1	70.08	89.5	629	238	56 <u>4</u>	0,002	Ε

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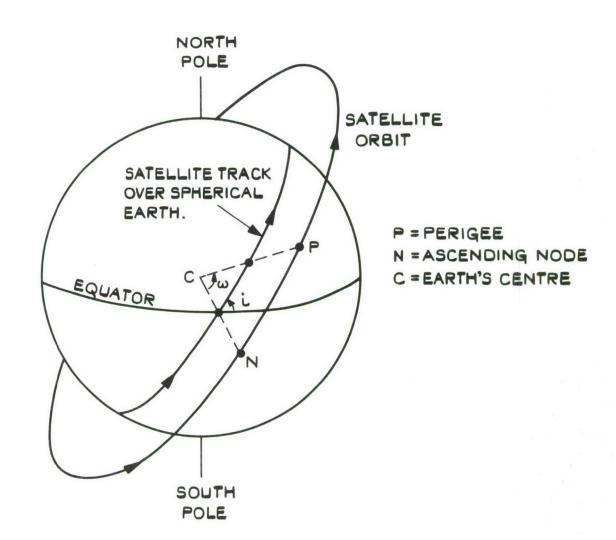


FIG. I DIAGRAM SHOWING DEFINITION OF INCLINATION ¿
AND ARGUMENT OF PERIGEE ω.